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ABSTRACT

To determine the relative effectiveness of different methods of preschool educational intervention for disadvantaged children, comparisons were made of five programs whose levels of structure ranged from the traditional nursery school to a highly structured preschool. Subjects were 79 4-year-olds representing a wide range of ability levels. Intervention effects were evaluated at the end of the preschool year and also, at the end of the kindergarten year. Follow-up data were collected at the end of first grade for three of the programs. Preliminary results were differential and encouraging for the more structured programs. The ameliorative preschool provided a framework for the subsequent investigation of related variables: effects of initiating the program with 3-year-old, low IQ children, and the feasibility of using paraprofessional staff as teachers. Included in this report are studies undertaken to provide instructional programs for children under 3 years and to find techniques to train mothers in home intervention. (MS)

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FINAL REPORT
Volume I of III Volumes
Project No. 5-1181
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RESEARCH AND DEVELOPMENT PROGRAM ON PRESCHOOL DISADVANTAGED CHILDREN

Investigations of Classroom and At-Home Interventions

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Bureau of Research

PREFACE

The studies and data presented in this report aim at two objectives. First, is curriculum development and evaluation; second is research on social and psychological factors in the intellectual functioning of culturally disadvantaged children.

Under the overall direction of Dr. Merle Karnes a number of highly qualified investigators have pursued these objectives with diligence and ingenuity. Furthermore, they have, in important instances, pursued objectives to conclusions which are at the very least provocative. To many they will be startling and disturbing. Thus the sociologists, Farber, Lewis and Harvey conclude in Volume III:

> Technical emphasis in educational reform (particulary that which is intended for the dispossessed) may preclude any possibility of educators making a positive contribution to the obliteration of the social and economic injustices which victimize millions of Americans...Technical emphasis in education, as it is in welfare services, is a symptom of a condition which may be termed progressive status-quoism.

Volumes I and II deal largely with the first objective, curriculum development and evaluation, and as such are excellent examples of the highest quality of the "technical emphasis" to which the sociologists on the team refer. In Volume I, Karnes, Hodgins and Teska attack such concerns as the relative effectiveness of five differing methods of preschool educational intervention with the disadvantaged child. Other concerns are to determine how long such special intervention must be continued, the optimum age for intervention, and, how much can be done by paraprofessionals in the classroom and by mothers in the home.

In Volume II, Bereiter, Engelmann, Washington and colleagues describe efforts to burrow deeper into the processes and products of educational intervention on behalf of the disadvantaged. Taking the view that the Stanford-Binet may be considered as an achievement test for the "hidden curriculum" of the middle-class home, they boldly set about to construct a compensatory curriculum geared to the Binet, and to test the curriculum. In so doing they throw new light on the criticism that substantial I.Q. gains in programs for the disadvantaged are merely a result of "teaching for the test." In another section Bereiter grapples with the theoretical complexities of interpreting changes in I.Q.

Volume III deals almost exclusively with the description and analysis of family and kinship, neighborhood and community variables that bear on children's readiness and competence to enter into formal education. Farber examines this transition from home to school in the perspective of the necessity of articulation and accommodation of private and public cultures. He posits that where private and public culture clash those families and individuals whose way of life is incompatible with the public culture are superfluous population. Harvey describes life in a white, lower class, semi-rural community. Because his frame of reference is the same as that of Farber and Lewis, his findings extend the implications of the total report beyond the question of racial differences. Lewis presents a sociologically derived model and definition of "competence." For him, competence is a social dimension and in that perspective input from the family, neighborhood, and community sets severe limits on the part that formal schooling can play in the development of competence.

This is a multi-disciplinary multi-volume work which on the one hand undertook, with success, to add to our knowledge of educational curricula and techniques which enhance the academic performance of culturally disadvantaged children. On the other hand, an equally important objective was to inquire into factors which underlay the intellectual functioning of children. In these volumes we are confronted with the cruel paradox that acceptance of conclusions arrived at in pursuit of the second objective, raises grave doubts as to the value of present day endeavors aimed at the first objective. Resolution of this paradox will not be for the timid.

William P. Hurder
Director, Institute for
Research on Exceptional Children

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The principal investigator wishes to express her appreciation for the outstanding contributions made by professional staff:

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Merle B. Karnes
Principal Investigator,
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INTRODUCTION

In the broad social concern with the poor and disadvantaged of our population which has characterized the 1960s, no program has appeared more hopeful than preschool education. Here, if anywhere, it seemed, was the point at which the cycle of deprivation might be broken, the predictable sequence of academic failure and early drop-out interrupted. The assumption that preschool experience would allow disadvantaged children to compete more favorably in the formal school setting was embodied in federal social policy through the support of Head Start without any real agreement, however, about the educational approaches most appropriate for this purpose.

It has long been supposed that traditional nursery schools prepare children in important ways for the educational experience they are soon to undertake in the public schools. Little research has, in fact, been done on the question of whether nursery school experience does have a lasting effect upon school adjustment and academic success, but we may assume that for children of middle-class backgrounds the preschool is at least moderately relevant to their later and more formal education. Such nursery schools can obviously assume the conventional advantages of middle-class life in the children who come to them, and they can count as well upon the support and interest of the parents, who are sure to have conventional academic aspirations for their children.

When we turn to the question of preschool education for children who are socially and economically disadvantaged, however, these facts are changed. By definition these children do not have the kind of background which middle-class children bring to the preschool. The cumulative deficiency in language development of the disadvantaged child (Deutsch, 1963), particularly as it relates to the acquisition of more formal language structures in the academic setting (Bernstein, 1961; Jensen, 1963; John and Goldstein, 1964) and to the development of the more abstract cognitive abilities (Ausubel, 1964), is generally accepted as the major challenge to preschool programming. Further limitations on the school progress of the disadvantaged child may be imposed by inadequate perceptual development (Deutsch, 1965), by reduced ability to concentrate and persevere (Deutsch, 1960), by inadequate motivation toward school success (Gordon and Wilkerson, 1966, p. 17), and by a depressed self-concept (Goff, 1954; Silverman, 1963). Whether the traditional nursery school experience can overcome these debilitating effects on learning ability of a disadvantaged environment or whether special educational programs must be designed has not been clearly resolved.

1|2|3

The studies in this volume generally focused on four major questions concerning the educational development of the disadvantaged preschool child:

1. What kind of classroom intervention is most effective?

2. How long must special classroom intervention be maintained to stabilize effective functioning?

3. At what age must educational intervention be initiated to prevent learning disabilities associated with cultural deprivation?

4. Can effective educational development be achieved by paraprofessional classroom teachers and mothers at home?

A major area of investigation was the comparative evaluation of five preschool interventions initiated with four-year-old disadvantaged children selected to represent a wide range of ability levels. These classroom interventions were chosen to represent levels of structure along a continuum from the traditional nursery school to the highly structured preschool. The effects of the five interventions were evaluated at the end of the preschool year and again at the end of the kindergarten year. For three of these interventions it was possible to obtain follow-up data at the end of first grade. The first two studies presented in this volume, then, are an evaluation of the immediate effectiveness of these interventions as well as the stability of improved performance as reflected in subsequent academic achievement in the public schools. Since preliminary results were differential as well as highly encouraging for the more structured programs, one of these (the Ameliorative preschool) provided a framework for the subsequent investigation of related variables: (a) the effects of initiating the Ameliorative program with three-year-old children and with low IQ children and (b) the feasibility of using paraprofessional staff as teachers in the Ameliorative preschool. Finally, in an effort to bring the advantages of preschool training to children at a still earlier age, a series of studies was undertaken to provide instructional programs for children under three years of age and to develop techniques that could be used in training mothers to intervene at home in the educational development of their children.

SUMMARY I. The Effects of Five Preschool Interventions: Evaluations over Two Years

This study was designed to evaluate the differential effects of five preschool interventions through batteries of standardized tests administered prior to the intervention, following the preschool year, and one year later at the end of kindergarten. The classroom interventions were chosen on theoretical as well as practical bases to represent levels of structure along a continuum from the traditional nursery to the highly structured preschool. The nature of teacher-child interaction was considered to be the critical dimension of structure: as the specificity and intensity of this interaction increases so does the degree of structure. Two programs (Traditional and Community-Integrated) represented the less structured end of the continuum; a third (Montessori) embodied an established theory which includes much that can be identified with a child-centered or traditional approach and a methodology which incorporates considerable structure; the fourth (Ameliorative) and the fifth (Direct Verbal) programs fell at the highly structured end of the continuum.

METHOD

The Five Programs of Preschool Intervention

During the first year of the study, 75 disadvantaged children, five class units of 15 children each, participated. Two class units were assigned to the Traditional program, two to the Ameliorative program, and one class unit to the Direct Verbal program. In the second year, an additional class unit was enrolled in the Direct Verbal program and a class unit was enrolled in each of the remaining intervention programs (Community-Integrated and Montessori). Children attended daily sessions of approximately two hours and fifteen minutes for a period of no less than seven or more than eight months.

The five programs of classroom intervention may be distinguished as follows:

1. Major goals of the Traditional nursery school program were to promote the personal, social, motor, and general language development of the children. Teachers were instructed to capitalize on opportunities for incidental and informal learning, to encourage the children to talk and to ask questions, and to stimulate their interest in the world around them. Music, story, and art activities were scheduled regularly. Outdoor play

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was a part of the daily routine; indoor play focused on a doll and housekeeping center, a vehicle and block center, and a small toy center.

2. The Community-Integrated program, operated at four neighborhood centers, provided a traditional nursery school experience similar to the one above. These centers were licensed by the state and were sponsored by community groups, and classes were composed predominately of middle- and upper-class Caucasian children. Two to four disadvantaged children from the research class unit attended sessions at one of these four centers. Socioeconomic integration was the pertinent variable rather than racial integration which was achieved in all programs. Central to the altered classroom dynamics in the Community-Integrated program was the presence of an advantaged-peer language model in addition to the teacher model provided in all programs. To the extent that children in a traditional nursery school acquire language from each other, the Community-Integrated program provided the optimum setting for verbal development.

3. The Montessori program was administered by the local society, and staff and classroom materials met Montessori standards. The daily schedule began with a routine health check and toileting. The group then met "on the line" for conversation, songs, finger plays, and exercises. The next half hour was devoted to "spontaneous choice" of approved materials and was followed by a second period on the line devoted to musical activities, stories, and games. A "practical life" demonstration, juice time, toileting, the silence exercise, and tidying the classroom occupied the next half hour. The final ten or twenty minutes of the session were given over to playground activities or supervised short walks. The specific nature of the "prepared environment" raised the level of structure within the Montessori classroom beyond that of the two traditional programs. The Montessori teacher did not, however, maintain the high level of specific control over the actions of the children required by the teachers in the two highly structured programs. Structure in the Montessori program derived not from direct teacher-child interaction but from the prescribed manner in which the child learned from the materials.

4. In the Ameliorative program, verbalizations in conjunction with the manipulation of concrete materials were considered to be the most effective means of establishing new language responses. A game format (card packs, lotto games, models and miniatures, sorting, matching, and classifying games) created situations where verbal responses could be made repeatedly in a productive, meaningful context without resorting to rote repetition; often the child could visually and motorically assess the correctness of his thinking before he made an appropriate verbalization. If the child was unable to make a verbal response, the teacher supplied an appropriate model; when he began to initiate

such responses, the teacher had the opportunity to correct, modify, and expand his verbalizations.

Each class unit (N=15) was divided into three groups on the basis of Binet IQ with one teacher for each group. The daily schedule was divided into three 20-minute structured learning periods: math concepts, language arts and reading readiness, and science-social studies. A large room where the 15 children could gather for group activities was available; however, instruction took place in cubicles which contained materials appropriate to the three content areas, and each teacher moved from one cubicle to another with her group of five children. Concepts taught during the structured periods were reinforced during directed play and especially during the music period.

The low pupil-teacher ratio allowed for differentiation of instruction to provide a high success ratio for each child. Immediate correction of incorrect responses (often through the repetition of model sentences or through duplicate layouts of small manipulative materials) and reinforcement of appropriate responses (usually through praise) assured the children of their competencies in handling curricular requirements and enhanced their intrinsic motivation to learn. Frequent review extended content previously presented and provided opportunities to use further the vocabulary and sentence structures which had been taught.

5. In the Direct Verbal program intensive oral drill in verbal and logical patterns was chosen as the mode for instruction since disadvantaged children were considered adequate in perceptual and motoric skills but inadequate in verbal and abstract skills. The class unit was divided into three groups of five children, initially on the basis of Stanford-Binet IQ scores and teacher evaluation. Each of the three teachers conducted a 20-minute learning period (language, arithmetic, or reading) for the three groups. The general instructional strategy was that of rule followed by application. A verbal formula was learned by rote and then applied to a series of analogous examples of increasing difficulty.

The language program focused on the minimum essentials of language competence. The objective was a kind of basic English that teacher and child may use in the conduct of elementary education--a basic English which does not embody all the concepts a child should master but which provides a medium through which those concepts may be learned. The process began by teaching a basic identity statement applied to familiar objects: "This is a _________. This is not a _________." When this statement was mastered, new language patterns were introduced: plurals, polar sets, prepositional phrases, sub-class nouns, active verbs, common tenses, and personal pronouns. The program culminated in the use of language for deductive reasoning.

The arithmetic program emphasized a "science of counting" without reference to phenomena that can be interpreted arithmetically. The disadvantaged child was assumed to lack the verbal and logical sophistication necessary to abstract arithmetic principles from everyday experiences. After the initial teaching of counting, arithmetic was taught through equations emphasizing the idea that any equation could be read as a statement of fact and also as an instruction that told how the fact could be established through a counting operation. The kind of pattern drill used in the language program to teach basic grammatical rules was also used in arithmetic.

The children were taught to read with a modified Initial Teaching Alphabet. Innovations had to do with the formation of long-vowel sounds and the convention for blending words. As early as possible, the children were introduced to controlled-vocabulary stories written by the reading staff.

Songs were especially written for the music period and provided practice in language operations which had been taught. Storytelling also provided additional practice in language operations and involved more question-and-answer activity than is common in reading stories to children.

Selection of Subjects

The subjects for this study were selected from the preschool population of the economically depressed neighborhoods of Champaign-Urbana, a community of 100,000 in central Illinois. Families judged by public aid and school authorities to be economically and educationally deprived were canvassed for children who had no previous preschool experience and who would be four years old before the first of December, an age appropriate for enrollment in public kindergarten the following year. A home interviewer determined final eligibility after she had completed a detailed family history. In addition, interviewers canvassed certain acutely disadvantaged sections of the city to locate children new to the community or otherwise unknown to the referring agencies.

The 1960 Stanford-Binet Intelligence Scale was administered to eligible children who were then stratified on the basis of their intelligence quotients into three groups: IQ scores 100 and above, 90 through 99, and 70 through 89. The children were assigned to class units (N=15) in which one-third of each class consisted of children who had scored in the "high" IQ range; one-third, the "middle" range; one-third, the "low" range. Mean intelligence quotients were then computed for the three strata and for each class unit. These means were evaluated for comparability between class units as a whole and for strata between classes. Class units were examined to assure comparability of sex and race.

When necessary, substitutions were made between classes to maintain an approximate ratio of 67% Negro children and 33% Caucasian children and a ratio of approximately 50% male and 50% female children. Finally, each class unit was randomly assigned to a particular intervention program.

Evaluation Procedures

Since the intent of this study was to evaluate over a two-year period the effectiveness of five classroom interventions upon the overall school readiness of disadvantaged children, evaluations were made prior to the intervention, at the end of the preschool year, and at the end of the kindergarten year in the following areas:

1. Intellectual functioning as measured by the 1960 Stanford-Binet Individual Intelligence Scale, Form L-M.

2. Language development as measured by the Illinois Test of Psycholinguistic Abilities, experimental edition, 1961.

3. Vocabulary comprehension as measured by the Peabody Picture Vocabulary Test.

In addition, the Frostig Developmental Test of Visual Perception and the Metropolitan Readiness Tests were administered at the time of the second and third batteries.

RESULTS AT THE END OF THE PRESCHOOL YEAR

The two highly structured programs (Ameliorative and Direct Verbal) demonstrated a substantial mean gain (13 points) in intellectual functioning (Binet IQ). No child in either program failed to make an IQ gain. On test two 92% of the children in the Ameliorative group and 74% of the children in the Direct Verbal group fell in the high intelligence strata. The other three groups made more modest mean gains (5 to 8 points) and from 15 to 24% of these children regressed. Clearly, the test-two performance of the Ameliorative and Direct Verbal groups on the Stanford-Binet was superior to the performances of the other three groups. Although the Traditional group was not significantly lower than the Ameliorative or Direct Verbal group, neither was it significantly higher than the Community-Integrated or Montessori group.

On the initial assessment of language development (ITPA) the children in this study were most deficit on the three subtests related to verbal expressive abilities: Vocal Encoding, Auditory-Vocal Automatic, and Auditory-Vocal Association. The Ameliorative group eliminated a major initial deficiency on each of these three subtests, and the Direct Verbal group eliminated a major deficiency on two of these three subtests. The Traditional group did relatively well in this area. The performances of the Community-Integrated and Montessori groups on these three subtests were static at best, and their substantial deficits remained at the time of test two. On the ITPA total the Ameliorative group was significantly higher than the Community-Integrated and Montessori groups but did not differ significantly from the Direct Verbal and Traditional groups. The Direct Verbal and Traditional groups were significantly higher than the Montessori group only.

The magnitude of the gains of the Ameliorative group on the nine subtests of the ITPA and the consistency with which it made these gains resulted in an essentially nondeficit test-two performance. The Traditional group made consistent but more modest gains and had no major deficits (deficits in excess of 6 months) at the time of test two. The Direct Verbal group made somewhat larger gains than the Traditional group but made these gains somewhat less consistently and had major deficits on two subtests at test two. The Community-Integrated and Montessori groups generally made smaller and less consistent gains than the other three groups. The movement of the Montessori group was somewhat regressive while that of the Community-Integrated group was more nearly static.

There were no significant differences among the five groups in vocabulary comprehension as measured by the Peabody Picture Vocabulary Test. The performance of the Ameliorative group in visual perception (Frostig) was significantly higher than those of the other four groups. On test two, over 75% of the children in the Traditional, Montessori, and Community-Integrated groups earned scores indicating a need for remediation; in the Direct Verbal group 43% of the children earned such scores. Only 21% of the children in the Ameliorative group scored at this low level. An assessment of school readiness (Metropolitan) indicated the statistical superiority of the Ameliorative and Direct Verbal groups in number readiness only.

CONCLUSIONS AT THE END OF THE PRESCHOOL YEAR

Since the five intervention programs were chosen to represent points along a continuum of structure, one might assume that the results would order themselves along this continuum to the extent that structure is a valid dimension in effecting change. Such was not the case. The children in the Ameliorative and Direct Verbal programs (high on the structure continuum) generally showed the greatest gains. Those who participated in the Traditional program (low on the structure continuum) showed more modest gains. Children in the Community-Integrated program (also low on the structure continuum) and those who participated in the Montessori program (midway on the structure continuum) showed the least progress.

The failure of the Montessori children to demonstrate appreciable progress seems to invalidate the notion that the level of structure relates to the progress made by the disadvantaged child. The Montessori program provided a high degree of structure in terms of careful planning for the kinds of motor-sensory activity appropriate to the development of an adequate base from which language and cognitive skills arise, and these provisions may be considered comparable to the activities used to elicit verbal responses (the game format) in the Ameliorative program or to the pattern drill employed in the Direct Verbal program. The Montessori teacher provided a "prepared environment" but did not systematically engage the child in verbalizations or require such verbalizations as part of the definition of productive involvement. This failure of the Montessori program resulted, at least during the intervention interval, in somewhat regressive language behavior. Structured emphasis on motor-sensory development without similar concern for verbal development programmatically moves in the wrong direction for the disadvantaged child.

The expectation that children in the Community-Integrated group would show progress equal to or greater than that of the children in the Traditional group was not substantiated. The disadvantaged children in the Community-Integrated program failed to incorporate the language model of their advantaged peers because they did not reciprocate in verbal interactions at any significant level. The homogeneity of the Traditional group, on the other hand, required these children to respond verbally during certain activities. Their teachers necessarily accommodated these activities to the verbal level of the children and gradually developed more acceptable and extended responses. The progress in verbal expressive ability made by the children in the Traditional program reflects this accommodation.

The very real progress made by the children in the Traditional program must be viewed against the generally superior performance of the children in the two highly structured programs. The effectiveness of directly teaching specific content was illustrated by the superior performance of the Ameliorative and Direct Verbal groups on the number readiness test of the Metropolitan. The magnitude and consistency of their gains in intellectual functioning (Binet IQ) clearly endorse the importance of providing a setting in which the child is required to make appropriate and increasingly complex verbalizations. There is some evidence that obtaining these verbalizations in conjunction with productive, manipulative experiences (Ameliorative program) more effectively developed visual perceptual skills (Frostig) as well as the visual-motor skills involved in certain ITPA subtests (Visual Decoding, Visual-Motor Sequencing, and Motor Encoding). In addition, children who made verbal responses concurrent with meaningful, manipulative experiences more effectively incorporated syntactical constructs into their verbal repertoire (Auditory-Vocal Automatic subtest). On the other hand, verbal pattern drills (Direct Verbal program) provided unique opportunities to develop the auditory reception of structured aspects of language (Auditory-Vocal Association and Auditory Decoding subtests).

THE SECOND YEAR OF THE STUDY

Interventions during the Kindergarten Year

During their second year in the study the children in the Traditional, Community-Integrated, Montessori, and Ameliorative programs attended public kindergarten for a half day where no research intervention was made. The children in the Ameliorative program attended public kindergarten in the morning and, in addition, participated in a one-hour supportive program at the research center in the afternoon. According to the research design, children in the Direct Verbal program were not to attend public kindergarten and were to return to the research center for a half-day program.

The children in the Ameliorative supportive program were divided into two classes of twelve children each. The one-hour session consisted of two periods--language development/reading readiness and mathematics concepts. An effort was made to avoid repeating activities which had already been provided in the morning public kindergarten and to emphasize activities directly related to first-grade academic success. Because the test-two performance of the Ameliorative group on all ITPA subtests had been essentially nondeficit, the major orientation of the supportive program was toward school readiness rather than language development. Since these children had demonstrated competence in visual perceptual skills (Frostig) and a mean Binet IQ substantially above 100 (only two children scored below 100) and because they were approaching an age appropriate to more specific academic endeavors, this shift in program emphasis seemed reasonable.

The Direct Verbal program in the second year of the study offered an extension of the first year's curriculum, and the children were again grouped by ability for 25-minute instructional periods in reading, arithmetic, and language. The language program included concepts of measure, the formal use of function words, and the vocabulary engendered by a study of part-whole relationships of over 100 objects. The Direct Verbal staff developed a highly systematized reading method which emphasized sub-skills such as blending, rhyming, visual discrimination, left-to-right orientation, and sequencing. The children were taught to recognize symbols as sounds and to combine these sounds, using the sub-skills, into words. In arithmetic the children received further work in the curriculum initiated the first year, and no significant alterations were made.

RESULTS AT THE END OF THE KINDERGARTEN YEAR

At the end of the second year of intervention, statistical comparisons were made between data from batteries one and three, and only inferences can be drawn between data from batteries two and three. Clearly the performance of the Direct Verbal group in intellectual functioning (Binet IQ) was superior to that of the other four groups. Only the children in the Direct Verbal group made a substantial gain during the second year (6 points). The four groups that attended public kindergarten the second year basically maintained the gains in intellectual functioning made during the first year, and losses or additional gains did not exceed 3 points. Although the supportive program for the Ameliorative group was unsuccessful in fostering further IQ gains, it may have been responsible for maintaining the relatively large gain of this group.

On the initial language development assessment (ITPA) these children were most deficit on three subtests requiring verbal expressive abilities: Vocal Encoding, Auditory-Vocal Automatic, and Auditory-Vocal Association. Of the three groups who attended only public kindergarten the second year, the Community-Integrated group demonstrated the least change on these three subtests. The Traditional group, although they had shown relatively good progress on these three subtests during the preschool year, tended to regress during the kindergarten year. The Montessori group, on the other hand, which had demonstrated a regressive pattern the first year, made substantial gains during the kindergarten year. The regressive performance during the second year of the fourth group who attended public kindergarten (Ameliorative) is particularly distressing since these children also attended the one-hour supportive program. The Direct Verbal group was the only group that showed continued and appreciable progress over the two-year period and was at or above its chronological age on the three subtests related to verbal expressive abilities. These results, together with the results on intellectual functioning, may be an indictment of public school programming for disadvantaged children but are clearly an endorsement of continued special programming.

On the ITPA total the performance of the Direct Verbal group was significantly higher than those of the other four groups. Differences between test-one and three performances for these four groups were negligible, and only the Direct Verbal group showed a substantial gain (7 months). Over the two-year period the Direct Verbal group consistently made gains which resulted in a nondeficit test-three performance on all ITPA subtests. The Ameliorative group made no appreciable regressions but its gains were more modest. On five subtests the Ameliorative group was above its chronological age at test three, but four major deficits (6 to 12 months) remained. The gains of the Traditional group were not of sufficient magnitude to result in any test-three performance above chronological age, and three of its deficits were of major proportions. The performance of the Montessori group was somewhat more erratic than that of the Traditional group; major deficits remained on three subtests, but on three subtests the Montessori group scored above its chronological age. At test three the Community-Integrated group had major deficits on eight subtests, two of which exceeded twelve months.

At the time of test three the Traditional group was significantly lower than the other four groups on the test of visual perception (Frostig). The Traditional group made no progress during the second year while the Montessori and Community-Integrated groups made substantial growth in this area during their year in public kindergarten. The Ameliorative group, which had been significantly superior at test two, showed modest but continued growth. The mean of the Direct Verbal group which had ranked second at test two now closely approximated that of the Ameliorative group. Children in the public kindergarten did indeed make gains in this area; however, the groups which participated in the structured academically-oriented programs had a considerably smaller percentage of children prone to reading failure, to the extent that reading failures are related to visual perceptual inadequacies.

On the assessment of school readiness (Metropolitan) the reading readiness performance of the Ameliorative group was significantly higher than those of the other four groups. This result is rather surprising in view of the Direct Verbal group's superiority in intellectual functioning (Binet) and language development (ITPA). The failure of the Direct Verbal group to achieve a performance superior to those of the other groups, especially the three groups who attended public kindergarten only, is puzzling since its curriculum included an intensive two-year reading program. A major intent of the Ameliorative supportive program had been to prepare children for formal reading instruction, and this focus appropriately developed reading readiness skills as measured by the Metropolitan. Thirty-eight percent of the children in the Ameliorative program achieved a superior reading readiness status, and 67% of the children in this group were rated high normal and above. No child in the other four programs earned a superior rating, and from 15 to 31% of the children in these groups were in the high normal range. Nearly equal percentages of the children in these four groups fell in the high, average, and low ranges. The favorable reading prediction for the large number of children in the Ameliorative program is complemented by the few children who received low-normal ratings, less than one-fourth the percentage of any other group.

On the Metropolitan Number Readiness Test the Ameliorative and Direct Verbal groups were significantly higher at test three than the other groups. A substantially higher percentage of the children in the Ameliorative group (63%) achieved a superior number readiness status; however, the percentages of children in the Ameliorative and Direct Verbal groups who were rated high normal and above (91%) were identical and higher than those of the other three groups (48 to 64%). Apparently disadvantaged children of preschool and kindergarten age profit from academically-oriented instruction in mathematics, and both programs seemed appropriate and effective with these children.

The children who participated in the Traditional, Community-Integrated, and Montessori programs the first year and who attended only the public kindergarten the second year generally demonstrated the least progress on the total battery. The performance of the Traditional group at the end of the first year more nearly approximated those of the two structured groups than those of the Community-Integrated and Montessori groups which changed little during the preschool intervention. The regression of the Traditional group and the modest progress of the Montessori group during the second year (the kindergarten year) resulted in similar test-three performances. The Community-Integrated group regressed substantially in important areas during the second year. The children in the Ameliorative group made progress equal or superior to that of the Direct Verbal group during the first year but regressed substantially in critical areas the second year. The one-hour supportive program was successful in fostering further development of school readiness (Metropolitan) and visual perception (Frostig). Only the Direct Verbal group made consistent and continued progress in all areas over the two-year period.

CONCLUSIONS AT THE END OF THE KINDERGARTEN YEAR

Only at the end of the first year of the study can differential results be directly attributed to the specifics of preschool intervention, since only then were the five programs comparable in terms of class unit composition, teacher-pupil ratio, and time. The second year of this study introduces new variables and cannot be viewed merely as a follow-up of the five preschool programs. For those interested in preschool programming for disadvantaged children, the data obtained at the end of the preschool year must remain of primary relevance.

It seems clear that one year of preschool programming, no matter how immediately effective, did not equip disadvantaged children to maintain performance in the kindergarten setting. Regardless of the progress made in preschool by the four groups of children which attended public kindergarten, their relative performances deteriorated during the second year, and the efficacy of kindergarten programming for disadvantaged children seems open to question. Since one of the principal findings of the first year was that intensive teacher-child interaction is critical to maximum language development and since this kind of interaction cannot occur with the teaching ratio of the public kindergarten, the deterioration in language development is not surprising. Only children in the Direct Verbal program, which maintained a low pupil-teacher ratio and intensive pupil-teacher interaction the second year, made continuing progress in language development.

During the first year of the study, Ameliorative programming was appropriate and highly effective, and children made remarkable progress in all areas, particularly those of initial inadequacy. This encouraging educational prognosis contributed to a shift in emphasis from language development to school readiness in the one-hour supportive program. The marked regression in verbal expressive abilities experienced by these children during the kindergarten year suggests that this shift in emphasis was ill advised or at least premature. The additional one-hour supportive program did indeed promote superior academic readiness but failed to maintain the level of language functioning achieved in the Ameliorative preschool.

Only children who attended the Direct Verbal preschool were provided low pupil-teacher ratios and intensive language programming over the two-year period, and only these children made continued growth in all aspects of the test battery. The second year IQ gain is particularly encouraging as are the remarkable two-year gains in verbal expressive abilities made by children in this group. Only in the area of reading readiness did these children fail to achieve the superior performance, and this study offers no direct evidence to support the early introduction of reading instruction to disadvantaged children.

SUMMARY II. A Follow-Up of Three of the Five Preschool Interventions: Evaluations over Three Years

Because all interventions were not initiated during the first year of the study, data at the end of first grade are not available for the Montessori and Community-Integrated groups or for the second Direct Verbal class unit. Follow-up data are, however, available for the Traditional group (N=25), the Ameliorative group (N=24), and the first class unit of the Direct Verbal group (N=10). The available N for the Direct Verbal group, therefore, is reduced from 23 to 10, and conclusions based on data obtained during the third year for this group must be tentative. Since the implications of the first two years were discussed in the preceding report, the major intent of this study will be to evaluate the status of the three groups at the completion of first grade.

Evaluations were made in the following areas prior to the intervention, at the end of the preschool year, at the end of the kindergarten year, and at the end of first grade:

1. Intellectual functioning as measured by the 1960 Stanford-Binet Individual Intelligence Scale, Form L-M.

2. Language development as measured by the Illinois Test of Psycholinguistic Abilities, experimental edition, 1961.

3. Visual perception as measured by the Frostig Developmental Test of Visual Perception.

In addition, the Peabody Picture Vocabulary Test was included in the first three batteries, the Metropolitan Readiness Tests were administered at the end of the preschool and kindergarten years, and the California Achievement Tests, Lower Primary Form W, were given at the end of the first grade.

The first intervention embodied the traditionalist point of view: a nursery school experience which worked in conventional ways to improve the personal, social, motor, and general language development of the children was followed by a traditional kindergarten under the auspices of the public school. The Direct Verbal program radically departed from the established view: The traditional preschool and kindergarten were seen as inadequate and inappropriate to the task of insuring the academic competencies of the disadvantaged child, and the experimental Direct Verbal preschool was provided for the two years prior to first grade. The Ameliorative program represented a middle ground: Amelioration of deficits related to school inadequacies began during the preschool year so that the disadvantaged child might benefit fully from the traditional kindergarten. The public kindergarten with a one-hour supportive program, it was assumed, would then be an appropriate prelude to first grade. Children from the three intervention programs attended first-grade classes under the sole supervision of the public schools, and all children were given the fourth battery of tests in the late spring of the third year of the study.

RESULTS AT THE END OF FIRST GRADE

School Achievement

Although important interim evaluations were made at the end of the preschool and kindergarten years, school achievement at the end of first grade was understood to be a critical criterion in assessing program effectiveness. The reading achievement of the Ameliorative and Direct Verbal groups as measured by the California Achievement Tests was significantly higher than that of the Traditional group. Two years of reading instruction in the Direct Verbal program prior to first grade seem to have been only as effective as the extensive readiness preparation in the Ameliorative program in producing accelerated reading development. This study provides little evidence to support the introduction of early reading programs for disadvantaged children.

The California language test assessed capitalization, punctuation, word usage, and spelling skills and bears little relation to language development as it is discussed elsewhere in this report. The performance of the Ameliorative group was significantly higher on this language test than that of the Traditional group. The performance of the Direct Verbal group approximated that of the Ameliorative group but failed to achieve significance. Since the skills required for successful performance on this test were not taught at the preschool or kindergarten levels (with the exception of limited spelling instruction for Direct Verbal children), the differential nature of this performance may reflect the superiority of the Ameliorative and Direct Verbal groups in general school readiness as evidenced on the Metropolitan Readiness Tests at the end of the kindergarten year.

The results of the Metropolitan Number Readiness Test at the end of the kindergarten year indicated that the two structured groups were better prepared for the more formal work of first-grade mathematics. The Ameliorative and Direct Verbal groups were significantly higher than the Traditional group on the California arithmetic test at the end of the first grade, confirming this prediction.

Intellectual Functioning

The Binet performances of the three groups were clearly differentiated over the three-year period. The performance of the Ameliorative and Direct Verbal groups was significantly superior to that of the Traditional group at the end of the preschool year. At the end of the kindergarten year, the Binet performance of the Direct Verbal group was significantly superior to that of the other two groups. (The Ameliorative group was very nearly significantly higher than the Traditional group.) At the end of the third year of the study, when all children were completing the first grade, there were no significant differences among the three groups. The modest preschool gain (8 points) of the Traditional group remained relatively stable during the following two years (5 points at the end of the first grade). Although the one-hour supportive program was unsuccessful in fostering a further gain for the Ameliorative group, it may have been responsible for maintaining the relatively large preschool gain (14 points). The Ameliorative group did, however, lose 6 points of this gain during the kindergarten and first-grade years. Only the Direct Verbal group received sustained special programming during the preschool and kindergarten years, and only the Direct Verbal group made large and continuing gains (13 and 10 points) during the first two years of the study. When special programming terminated and these children entered the first grade of the public schools, they experienced a sizeable loss (11 points).

Language Development

Initial ITPA total language age deficits for the three groups were four to five months. At the end of the preschool year, the groups were performing very nearly at their respective chronological ages. The Traditional group maintained a small deficit, and the Direct Verbal group achieved a modest acceleration. The Ameliorative group made the largest gain and was functioning nearly three months above its mean chronological age. During the second year of the study, only the Direct Verbal group made continued gains, and its ITPA total performance was significantly higher than those of the Ameliorative and the Traditional groups. The losses of the Ameliorative group during the kindergarten year resulted in a test-three performance two months below its chronological age while the losses of the Traditional group resulted in a test-three deficit which very nearly equaled its initial deficit. There were no statistical differences among the ITPA total performances of the three groups at the end of the third year of the study. All groups regressed during the first-grade year. The extent of the losses of the Traditional and Ameliorative groups during the kindergarten and first-grade years exceeded the gains they had made in the preschool year. Although the Direct Verbal group was performing at its chronological age, the loss experienced by this group during the first grade exceeded its gain of the kindergarten year and does not support an encouraging language prognosis.

Visual Perception

At the end of the preschool year, the performance of the Ameliorative group on the Frostig Developmental Test of Visual Perception was significantly higher than that of the Traditional group only. During the kindergarten year, the Ameliorative and Direct Verbal groups made continuing progress and were significantly higher than the Traditional group which regressed slightly. All groups made progress during the first-grade year; however, the Traditional group made a substantial gain and there were no longer significant differences among the groups. Initially, nearly all of the children fell in the lowest quartile on this instrument. At the end of the first grade, only 8% of the children in the Ameliorative group scored in the lowest quartile while 20% of the Direct Verbal children and 48% of the Traditional children earned such scores.

CONCLUSIONS AT THE END OF FIRST GRADE

No intervention program was entirely successful in providing the impetus necessary to sustain at the end of first grade the gains in intellectual functioning and language development made during the preschool years. In spite of the disappointments of some of the longitudinal data, however, a major accomplishment of this study remains: Serious learning deficits of the disadvantaged children in the Ameliorative and Direct Verbal groups were eliminated during the preschool year. In the Direct Verbal program, where an extensive intervention was sustained over a two-year period, continued growth occurred. The deterioration in language and intellectual functioning which occurred at the termination of intensive programming demonstrates the need for continued intervention characterized by low pupil-teacher ratios which make possible the interaction necessary for language development and which provide the opportunity to design and implement learning experiences to achieve specific goals.

Although these three short-term interventions (even a two-year classroom intervention is essentially a short-term effort) did not differentially alter intellectual functioning in any permanent fashion, two aspects of the Binet data have important implications. The sizeable gain of the low strata children in the Ameliorative group remained stable, most pertinently, during first grade when no research intervention was provided. It seems justifiable to conclude that the Ameliorative program offered particular opportunities to develop the intellectual functioning of low-normal and slow-learning children. The small number in each stratum of the Direct Verbal group preclude discussion of gains by strata. The IQ losses experienced by the high strata children in both the Traditional and Ameliorative groups during the first grade are of real concern and resulted in an IQ change in a negative direction over the three-year period. The modest gain of the Traditional high stratum and the substantial gain of the Ameliorative high stratum during the preschool year remained constant through the kindergarten year but were lost during the first grade. It seems reasonable to assume that in important ways the public schools during first grade failed disadvantaged children with demonstrated potential. This assumption is further supported by the substantial regression during first grade of 24 of the 26 children from the three intervention groups who had scored 110 and above at the end of kindergarten.

Since the intent of preschool intervention for disadvantaged children is to alter in positive ways later school performance, both structured programs must be judged successful. Virtually all of the children in the two structured programs were making at least adequate academic progress. In spite of two years of traditional preschool programming, nearly half of the children in the Traditional group obtained California scores which indicated sharply limited school achievement. This differential achievement level demonstrates the potential for school success among disadvantaged children which can be developed through structured preschool experiences. Functioning effectively in the public school setting is a critical first step in altering the life circumstances of the disadvantaged child to the end that he may participate more fully in the educational and economic opportunities of a democratic culture.

SUMMARY III. Earlier Intervention: Effects of the Ameliorative Program Initiated with Three-Year-Old Children and Maintained for Two Years

This study was concerned with the effects of the Ameliorative program initiated with three-year-old disadvantaged children and maintained over a two-year period. The progress of the three-year-old children after one year in the Ameliorative program was compared to that of the four-year-old children who had been enrolled in the previous Ameliorative program. At the end of the second year of the study, the progress of the children who participated in the Ameliorative program for two years (as three-year-olds and as four-year-olds) was again compared to that of the children who had participated in the Ameliorative program for only one year (as four-year-olds).

Recruitment procedures were the same as those employed in the earlier studies, except that the children were three years old before the first of December, an age appropriate for enrollment in the public kindergarten in two years. Race and sex ratios and the three intelligence strata class design were maintained.

Since the Ameliorative program had been developed as a one-year intervention for four-year-old children, a number of accommodations were necessary to use this program with three-year-olds over a two-year period. During the first year, material was presented at a slower rate and concepts were introduced at their simplest levels. During the second year, units of work not taught the first year were covered and new units were added, particularly in the social studies-science curriculum. Units which had been taught at a minimal level the first year were expanded the second year beyond the level reached by other Ameliorative classes for four-year-olds. The teacher-pupil ratio (1:5) and the daily schedule of the previous Ameliorative program were maintained over the two years.

RESULTS

There was no significant difference between the progress made by the three-year-old children during one year in the Ameliorative program and that made by four-year-old children in one year on any component of the test battery (Binet, Peabody, Frostig, and ITPA total).

The progress made in two years by children who began the Ameliorative program at the age of three was not superior to that made in one year by children who began the program at the age of four on any instrument in the test battery. Doubling the length of intervention with apparently appropriate program accommodations had no appreciable impact.

The results at the end of the first year of the study generally endorsed the earlier initiation of the Ameliorative program. The first-year gains of the younger group essentially matched the remarkable gains made previously by the four-year-old children in the Ameliorative program. This acceleration did not continue during the second year. Maintaining an essentially nondeficit performance may in itself represent a major achievement, particularly in view of the tendency of disadvantaged children in this and other projects to fail to maintain very promising first-year gains. The accelerated rate of growth achieved during the first year and the demonstrated stability of these gains the second year suggest an optimistic school prognosis for these children.

SUMMARY IV. The Effects of Short-Term Instruction at Home by Mothers of Children not Enrolled in a Preschool

This study was designed to evaluate the effects of short-term at-home instruction by mothers on the intellectual and language development of their children. Neither experimental nor control children were enrolled in a preschool, and only the mothers of the experimental children were enrolled in a training program designed to help them make instructional materials to use in teaching their children at home. It was hypothesized that preschool children of mothers in the training program would demonstrate gains in intellectual functioning and language development significantly greater than those shown by children whose mothers were not involved in a training program. Instruments used for pre- and post-evaluation were the Stanford-Binet Individual Intelligence Scale (1960 edition) and the Illinois Test of Psycholinguistic Abilities (experimental edition, 1961).

METHOD

Subjects

Subjects were selected from Negro families in an economically depressed area who had been referred by the principal of the neighborhood elementary school. Children were to be four years old before December first, and attendance at a preschool disqualified a child. A control and an experimental group (N=15) were established with comparable mean intelligence quotients and sex ratios.

Intervention

The mothers of the experimental children attended eleven weekly two-hour meetings conducted by three preschool teachers at the neighborhood elementary school. Each teacher worked closely with a group of five mothers. As part of the project staff, mothers were paid $3.00 a session but received no remuneration for the time spent working with their children at home. At the beginning of each session the mothers made educational materials to use during the following week in teaching their children at home. Inexpensive materials or items commonly found in the home were incorporated into these activities. The teachers taught the mothers songs and finger plays and distributed copies as a teaching aid at home. Books and puzzles were available on a lending-library basis. Language development was the major emphasis of all activities which were designed to teach the child to label objects in his immediate environment, to make more precise verbal observations, to generalize, to use grammatically correct forms, to understand and to ask questions, and to formulate answers.

When a mother was absent, the other mothers made the materials for her and the teacher delivered these and the instructions for their use to the home the following week. In addition, the teacher visited each home at two-week intervals to become acquainted with the child, to demonstrate teaching techniques, to evaluate the appropriateness of the activities by observing mother and child at work, and to assess the extent to which mothers were working with their children.

RESULTS

Intellectual Functioning

The results of the study confirm the hypothesis that the experimental subjects would evidence gains in intellectual functioning (Stanford-Binet) significantly greater than those made by the control subjects. The mean gain of the experimental group was 7 points, while the control group made no gain.

Language Development

It had been hypothesized that the experimental subjects would make gains in language development (ITPA) significantly greater than those of the control subjects. The results do not clearly confirm this hypothesis. There were no significant differences in favor of the experimental group in gains on any subtest; however, on three subtests and the ITPA total there was a trend (.10) in their favor. On eight of the nine subtests the gains of the experimental group were at least twice the program interval of approximately three months. The control group achieved this level of gain on only three subtests.

DISCUSSION

This intervention, teaching mothers to make educational activities from low-cost materials to use in teaching their children at home, was not determined by budgetary requirements; rather, it was chosen as a means of insuring the mother's active participation in the meeting and her effective teaching at home. The practical nature of this program in terms of facilities, personnel, and budget does, however, increase its potential for reaching large numbers of children. The results of this study, particularly in view of its short-term nature, seem to be a clear demonstration that mothers can be effectively involved in direct educational intervention with their preschool children at home.

SUMMARY V. The Impact of At-Home Instruction by Mothers on Performance in the Ameliorative Preschool

Because of the encouraging results obtained in the short-term study of the effects of at-home instruction by mothers (Summary IV) and to develop a more positive relationship between home and preschool, the mother-involvement program was incorporated into the operation of the Ameliorative preschool. It was expected that children whose mothers worked with them at home in areas related to those taught at the preschool would make additional progress. The evaluation, therefore, involved a comparison of the progress of children taught by their mothers at home and by teachers at the preschool with that of the earlier group of children who had received instruction only in the preschool. The specific intent of this study was to determine areas in which instruction by mothers influenced performance.

METHOD

The Ameliorative program provided all children in this study has been described previously (Summary I), and the mother-involvement program was patterned after the earlier, short-term study (Summary IV). An additional dimension to the mother-involvement meetings, primarily made possible by the extended length of the program (from twelve weeks to seven months), was an emphasis on broader community interactions.

Recruitment procedures were the same as those employed in the earlier studies. Race and sex ratios and the three intelligence strata were maintained for the Ameliorative classes which incorporated the mother-involvement program.

RESULTS

The post-intervention performance of the Ameliorative group with mother involvement was nearly identical to that of the Ameliorative group with no mother involvement on the Binet, Frostig, and Metropolitan Readiness tests. On four ITPA subtests, two of them in the critical area of verbal expressive abilities, significantly higher scores were achieved by the children whose mothers were not involved in the program. In no way did the results of the test battery confirm the expectations of the study.

DISCUSSION

Any explanation of these results must necessarily be speculative. Since this study combined a mother-involvement program with a preschool program, it seems logical to question whether either component was altered when the two were combined. There is little basis to assume that the subsequent Ameliorative program was less effective than the original, and, in fact, project staff generally agreed that the later program was superior in terms of curriculum organization and availability of materials. The mother-involvement program, however, necessarily required expansion and specific accommodations since the children now received instruction at school as well as at home. In retrospect, changes which seemed relatively minor, coupled with the child's preschool attendance, may have significantly altered the mother's perception of her role in this program. In the short-term study, the mother was aware that she was the only active agent for change in her child. In the longer study, mothers appreciated the value of the activities for their children but may have over-emphasized the role of the preschool in achieving the goals of the program.

In spite of the statistical results, project teachers continue to be enthusiastic about mother involvement in conjunction with preschool and feel that their observations of the children in the classroom support this view. Teachers believed that a meaningful home-school relationship had developed over the seven months, and there was evidence that some mothers generalized from this preschool experience to the public school and wider community levels.

SUMMARY VI. Implementing the Ameliorative Program with Paraprofessional Staff

It was the intent of this study to determine whether a paraprofessional teaching staff indigenous to the poverty area could, through sustained inservice training and daily supervision, implement the highly specific instructional program developed in the Ameliorative preschool. Four class units participated in this study. The first two were taught by professional staff and are described as the Ameliorative intervention in Summary I. The third class unit was staffed by three, young, Negro mothers who had no previous teaching experience and no formal education beyond high school. The fourth was taught by sixteen- and seventeen-year-old girls enrolled in a high school work-study program. In addition, a qualified preschool teacher served as the paraprofessional trainer in each of the latter two units.

METHOD

Selection of Subjects

Procedures to recruit children for the class unit taught by the adult paraprofessional staff were the same as those employed in the earlier preschool studies. Race and sex ratios and the three intelligence strata were again maintained. Recruitment procedures for the class unit taught by the teenage paraprofessional staff only approximated those used in the earlier studies because this program was operated at a community nursery school in a target area housing project.

Intervention

The length of intervention, the daily schedule, the teacher-pupil ratios, and other aspects of classroom mechanics in the two class units taught by paraprofessionals were patterned after those of the Ameliorative preschool (Summary I). A major effort was made to insure that the teaching strategy employed by the paraprofessionals and the curricular units they implemented followed those of the earlier study which provided the basis for comparison. To fulfill this intent, a procedure was developed whereby a professional teacher provided inservice training for the three paraprofessional teachers under her direction. The supervisory teacher assumed full responsibility for the long-range educational goals of the program and for the specific instructional plans and was present in the classroom each day to assess the appropriateness of her plans for the children as well as the effectiveness of her paraprofessional staff in executing these plans. She did not, however, assume the role of classroom teacher herself.

Evaluation Procedure

To evaluate the effectiveness of paraprofessional staff in implementing a highly specific preschool instructional program the performance on a standardized battery of tests (Binet, ITPA, Frostig, Metropolitan) of children taught by paraprofessionals was compared to that of children taught by professional staff implementing the same instructional program.

RESULTS

The staff variables explored in this study (professional, adult paraprofessional, and teenage paraprofessional) did not produce significantly differential performances on any component of the evaluation battery. Particularly on the assessment of general school readiness (Metropolitan) and visual perception (Frostig) were the similarities among performances striking. Only minor qualifications need be made: (1) There is some evidence that children instructed in the Ameliorative curriculum by paraprofessionals did not achieve large IQ gains as consistently as did the children taught by professionals. (2) IQ gains by intelligence strata in classes taught by paraprofessional staff were not as uniform as those in classes taught by professional teachers. (3) Relatively poor performances on the Motor Encoding subtest of the Illinois Test of Psycholinguistic Abilities and on the three subtests related to verbal expressive abilities were demonstrated by children taught by paraprofessionals. Generally, however, the results of this study clearly endorse the feasibility of alleviating preschool staffing problems through employing paraprofessional teachers who receive sustained inservice training and daily supervision. The paraprofessionals, adult and teenage, who participated in this study did indeed demonstrate the ability to implement the highly specific instructional program developed in the Ameliorative preschool as effectively as professionally trained teachers.

CONSIDERATIONS INVOLVED IN PARAPROFESSIONAL STAFFING

Although the analysis of the evaluation battery did not reveal significant differences between the group taught by the adult paraprofessionals and the group instructed by teenagers, the supervisory teachers in written evaluations of their respective staffs described conspicuous and pertinent variables. The performances of the adult paraprofessionals in all aspects of these evaluations were rated superior to those of the teenage teachers. Although the paraprofessionals at both age levels lacked teaching experience and knowledge concerning the goals of a preschool, the teenagers failed to acquire the genuine sense of commitment to the program which the adult paraprofessionals (all mothers themselves) developed almost immediately. The teenagers exhibited rather chronic absenteeism which was never demonstrated by the adult paraprofessionals and personnel turnover was high among this younger staff. The teenagers tended to be somewhat defensive about suggestions which seemed in any way critical of their work. They often saw the supervisor as an authority figure with whom they did not identify and toward whom they felt somewhat rebellious. The adult paraprofessionals, on the other hand, viewed their supervisor as "part of the team" and were eager to extend their responsibilities within the classroom. The supervisory teacher of the teenage staff felt that although these young teachers acquired many of the skills necessary to present curriculum materials to young children and to handle discipline problems in a constructive manner, their growth as teachers was limited because they did not adequately develop the ability to evaluate objectively the progress made by the children within their instructional groups. The young mothers found less difficulty in observing and evaluating child behavior and became rather ardent and articulate promoters of the preschool program. The teenagers saw little relevance in this work experience for their occupational future while the paraprofessional adults sensed the relevancy of this experience to their roles at home and in the community and considered such training pertinent to future employment goals. There seemed little question that in terms of transfer to the field the inservice training of adult paraprofessionals indigenous to the poverty area as teachers of disadvantaged children was a more feasible tactic than was a similar program for teenage girls.

SUMMARY VII. The Effects of the Ameliorative Program with a Class of Low IQ Children

The intelligence strata design used in the other studies in this research project resulted in a mean IQ for each class unit higher than the mean IQ of the population screened, and recruitment each year resulted in a surplus of low strata subjects. In the third year of the project, the fifteen four-year-old children for whom there were no vacancies in low strata or who fell below the cut-off of 70 were placed in a single class. Classroom mechanics, teaching strategy, and curricula were essentially the same as those provided other Ameliorative classes (Summary I). The basic intent of the research was to evaluate the effectiveness of the Ameliorative program with this atypical group rather than to devise a new intervention program.

Since no control group was available to compare with this atypical class and since the other research class units could not be used for direct statistical comparison, the evaluation of this group relies only on a consideration of gains. The Binet IQ gain (21 points) of the low IQ children was statistically significant at the .001 level. No child made a gain of less than five IQ points and 80% of the children made gains of 15 or more points.

Assessment of the language development which occurred during this program is extremely difficult since many low IQ children were initially unable to perform on ITPA subtests. Since the initial level of deficit could not be assessed with accuracy, statistical tests of gains were inappropriate. To some extent, the positive impact of the program can be seen in the increased number of children scoring within the subtest norms. At test one, essentially none of the fifteen children were able to perform on four subtests; on two additional subtests, nine children were below the norms. At test two, with the exception of the Auditory-Vocal Automatic subtest, virtually all of the children fell within the normative range of this instrument.

The discouraging school prognosis at test two (a mean Binet IQ in the slow-learner range and substantial deficits on all ITPA subtests) does not invalidate the very real progress made by the low IQ children in the Ameliorative program. During the 9-month program interval their mean Binet mental age increased 19 months and their ITPA total language age, 12 months -- remarkable progress for a group of children whose initial mean IQ was 66. Clearly, a one-year intervention at this age for this population is not adequate, and earlier and sustained intervention may well be required to effect the level of change necessary for successful school performance for a substantial number of these children.

SUMMARY VIII. The Effects of Early Education with Disadvantaged Infants

The purpose of this study was to determine whether intellectual functioning can be stimulated more effectively at a very young age than at the age of four. Thirty younger siblings (between the ages of 8 months and 2 years) were selected from the group of four-year-old disadvantaged children who had been admitted to preschool classes in the earlier stages of the larger research project. Fifteen experimental children received one hour of training a day in their homes for one year and were then admitted to a preschool of three-year-olds the second year. The experimental children were compared with the control children after the first year and again after the second year. In addition, the test scores of both the experimental and control groups were compared with the test scores of their older siblings when they had been admitted into the preschool at the age of four.

METHOD

Tests Administered

Tests and evaluations were administered to the thirty infants before the experiment and at the end, as follows:

a) During pretesting: (1) The Cattell (1960) Infant Intelligence Scale, (2) Caldwell's (1966) Assessment of Home Stimulation, (3) The Fels Parent Behavior Rating Scales (Baldwin, Kalhorn, and Breese, (1949), (4) Fokes (1965a) Outline of Language Development, (5) An Instrument for Assessing Infant Psychological Development (Uzgiris and Hunt, 1966), (6) a pediatric examination, and (7) Fokes (1965b) Outline of Motor Development. These tests and evaluations were administered initially for the purpose of studying the children and aiding in organizing a tutorial program in the home.

b) Posttesting evaluations were made after one year of tutoring and after one year of preschool. Posttests reported in this study are (1) the Stanford-Binet, Revised Form L-M, and (2) The Illinois Test of Psycholinguistic Abilities (experimental edition). These tests were given only as posttests since the children were too young for these tests during the initial battery.

Development of Tutorial Program

Because the experimental subjects were found to be normal in motor development, the initial phase of the program, while essentially sensory-motor, emphasized eight areas of cognitive development: (1) language, (2) symbolic representation, (3) space, (4) number, (5) classification, (6) time, (7) reasoning, and (8) imitation. After an exploratory period, tasks designed to promote learning in these areas were organized on the basis of a developmental sequence.

The Second-Year Program

At the conclusion of one year's tutoring, the experimental children were placed in a half-day preschool for seven months. The program provided was similar to the first-year program described by Karnes in this report (Earlier Intervention: Effects of the Ameliorative Program Initiated with Three-Year-Old Children and Maintained for Two Years).

RESULTS AND DISCUSSION

Changes in Rate of Mental Development

The experimental and control children had IQ's of 98.9 and 99.2 respectively on the Cattell Scale of Intelligence at the beginning of the experiment, when their average age was 16.9 and 17.0 months respectively. The experimental group gained approximately 5 points in IQ during the year in which they had tutoring at home for one hour a day and an additional 11 points in IQ the second year when they were trained in the structured Ameliorative program. The Control group, on the other hand, lost 2 IQ points during the first year. The second year, while they were still at home, they gained 5 IQ points. (These comparisons must be made with caution. The first IQ mean was obtained on the Cattell test, whereas the second and third scores were obtained on the Stanford-Binet.) Although the 7 point IQ difference between the groups after one year of tutoring in the home was statistically significant, the question remains whether this difference has psychological significance. Ordinarily, spurts in IQ come during the initial stages of instruction with a plateau or only slight increase the second year. The results here are the reverse. The second year's instruction in a group effected a wider difference between groups than did the first year's tutorial program.

A second comparison involved the difference in intellectual functioning between the group of children who had early training and their older siblings who did not receive intervention before the age of four. There was a difference of 22.8 IQ points between the experimental children, who had intervention for 2 years between the ages of one and three and one-half, and their siblings, who were examined at age 4 and who did not have intervention. The control infants at age 3-6 who did not receive preschool intervention were 7.9 IQ points higher than their four-year-old siblings who also received no preschool intervention.

Rate of Psycholinguistic Development

The Illinois Test of Psycholinguistic Abilities was administered at the end of the experiment to both groups of children and to their older siblings. Only the experimental group showed a positive standard score (+.45). The control group, with a standard score of -.73, was 1.18 standard scores below the experimental group, and the siblings at an older age had standard scores of -.87 and -.61. Although these data present some evidence on the effects of early training, they do not furnish us information on whether the gains were the result of the one-hour-a-day of tutoring during the first year, of the group experience in the preschool the second year, or of a combination of these two experiences.

Discussion

The results of this study indicate quite clearly that for disadvantaged children preschool intervention at age three produces significant acceleration in mental development when compared with the development of disadvantaged children who did not receive such intervention. The results support the hypothesis that early intervention is beneficial. The major hypothesis of this study, however, was that tutoring in the home for infants between the ages of one and two years for one hour a day would prove more beneficial than initiating intervention at the age of four. The conclusion that such tutoring is warranted seems dubious in the light of the fact that the experimental group made greater increases in IQ when entering the Ameliorative preschool at the age of three than they did in the infant program. The hypothesis, then, that home training for one hour a day before the age of three is more beneficial than training at a later age appears to be negated. It should be pointed out, however, that this experiment does not exclude the possibility of obtaining marked improvement in children when intervention is initiated in the home at the age of one and two, if the intervention consists of a program that includes more than one hour of tutoring.

SUMMARY IX. Training Mothers to Instruct Their Infants at Home

The infant tutorial program (Summary VIII) implemented in the larger research project required staff and budgetary commitments at impractical levels, and a more feasible tactic, based on the mother-involvement studies described earlier (Summaries IV, V, and VI), seemed to be the training of mothers to carry out an instructional program with their own infants at home.

METHOD

Recruitment

Twenty mothers with infants between the ages of twelve and twenty-four months were recruited from the economically depressed neighborhoods of Champaign-Urbana, a community of 100,000 in central Illinois. During these initial contacts, the mother was asked if she were able to attend a two-hour class each week where she would be instructed in teaching techniques to use with her infant at home. She would be paid $1.50 an hour to attend these meetings and transportation to and from the meetings would be provided. She was asked, further, to agree to apply these teaching techniques with her infant for a period of time each day. She would not be paid for this work-time at home, but the toys used to implement the instructional program would be given to her baby.

Background of the Subjects

After enrollment had stabilized, the group of twenty included eighteen Negro and two Caucasian mothers. Six mothers had been born in the North; the others had migrated from the South. The mean age of these mothers was 29.4 years; their educational level, 9.2 years; and they had a mean of 4.9 children. Public assistance through Aid to Dependent Children was the source of support for sixteen of the families included in this study. Six of the mothers were employed on a full-time basis. Five of the marriages of these twenty women were considered intact.

The mean chronological age of the twenty infants who participated in this study was nineteen months at the time of the initial intelligence test with a range of 14 to 26 months. Nine of these subjects were female, 11 were male; 18 were Negro and two were Caucasian. The initial mean Cattell IQ of this group was 97.6, and IQ scores ranged from 79 to 120.

Intervention

To encourage discussion, the twenty mothers were divided into two groups of ten which met separately throughout the program. Two staff members conducted the weekly two-hour meetings over the seven-month period. In addition, they made monthly (more often when necessary) home visits to reinforce the teaching principles introduced at the meetings and to help each mother establish a positive working relationship with her baby. These visits also provided staff members an essential observation of the appropriateness of the infant curriculum as well as their success in communicating teaching strategies to the mothers. In general, the weekly meetings were divided between child- and mother-centered activities. The first category included the presentation of educational toys and materials with an appropriate teaching model. The mother-centered activities involved group discussion directed toward child-rearing problems in today's society but intended to foster a sense of responsibility in the mothers for themselves, their families, and the community in which they live.

Evaluation Procedures

Interim data were to be collected and evaluated at the end of the first and second years of the study. When the children reached the age of four, postdata were to be collected and the study terminated. Three major comparisons were to be made: (1) A comparison at the end of each year of the study between the twenty children whose mothers had been trained to teach them at home and a comparable group of twenty children whose mothers had not been provided with this training (2) A comparison at the age of three years between the twenty children whose mothers had been trained to teach them at home and a group of middle-class children (3) A comparison between the twenty children whose mothers had been trained to teach them at home and the infants who were tutored by professional personnel (Summary VIII). Because of the termination of funding, this study continued only seven months and these longitudinal comparisons are not possible. Since a control could not be maintained, that interim comparison could not be made nor could the interim comparison with the infants tutored professionally, since the length of tutorial intervention doubled the intervention period of this study at its termination.

Initially all infants were administered the Cattell Infant Intelligence Scale and were to have received the Stanford-Binet Intelligence Scale at the end of the first year. At the termination of this study, eight infants were incapable of being tested with the Binet and were administered the Cattell. In the absence of a control and over so truncated an interval, these standardized tests offer little information appropriate to program evaluation. An attempt was made to provide an evaluation through a consideration of the data recorded by staff members during the monthly home visits and after each weekly meeting. Data was analyzed on pertinent variables from three categories: mother participation, mother-child interaction, and child performance on nine program tasks.

RESULTS

Mothers who worked full-time outside the home were not active program participants either at the meetings or within their own homes. The teaching relationships they established with their infants were inferior and their children generally did less well on program tasks. Finally, on the initial Cattell and on the post-Binet these children ranked lower than the children of nonworking mothers.

The younger children of nonworking mothers scored highest on the initial Cattell and on the post-Binet. In spite of their lower CA, these children did as well on program tasks as the somewhat older children of working mothers. The level of mother participation and the quality of mother-child interaction for this group was clearly superior to that found in the group of working mothers but clearly inferior to that observed in the group of nonworking mothers with older infants, a discrepancy which may be related to the developmental nature of many of the program tasks.

The older children and their nonworking mothers demonstrated the superior performance on all evaluations with the exception of post-Binet scores where these children ranked second. The high level of participation of the women in this group and their commitment to program goals were clearly indicated by their remarkable attendance record, their ability to extend their teaching skills in innovative ways, and their 100% endorsement of a second-year program. Their teaching effectiveness is reflected in the interest shown by their children in the program materials, in their level of spontaneous verbalization, and in their consistent mastery of program tasks.

CHRONOLOGY

Group	N	1965		1966		1967		1968
		Battery 1		Battery 2		Battery 3		Battery 4
Traditional	25	52.4*	preschool	60.4	pub. Kdg. only	72.6	pub. 1st grade	83.4
Ameliorative	24	52.1	preschool	60.0	pub. Kdg. + supportive program	72.2	pub. 1st grade	83.2
Direct Verbal	10	51.1	preschool	58.6	2nd yr. preschool no pub. Kdg.	71.1	pub. 1st grade	82.0
				Battery 1		Battery 2		Battery 3
Direct Verbal	13			50.2	preschool	59.7	2nd yr. preschool no pub. Kdg.	71.1
Community-Integrated	16			48.7	preschool	58.2	pub. Kdg. only	70.2
Montessori	13			49.8	preschool	58.7	pub. Kdg. only	70.8

*Mean Binet chronological age in months

The Effects of Five Preschool Interventions: Evaluations over Two Years

Merle B. Karnes, Audrey S. Hodgins,
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The involvement of culturally disadvantaged children in preschool education, an experience traditionally reserved to children of more affluent parents, can now be regarded as the major educational phenomenon of the 1960s. Backed by federal funds and spurred by a sense of moral and social urgency, community groups of many different kinds launched preschool programs. Dispensing with rigid professional requirements and having little in the way of established educational theory to draw upon in meeting the special needs of these children, the programs were necessarily innovative. Even when they failed, they served to open the questions of preschool education in fundamental ways.

Interpretations of programs initiated early in this innovative and productive decade were undertaken in only the most general way. As David Weikart (1967) pointed out at a recent symposium on the education of disadvantaged children, comparison and evaluation could not be made with conviction or precision because of the variety of programs and the lack of comparable data and follow-up studies. Weikart concluded that the appropriate area for experimental investigation has become the effectiveness of specific interventions rather than the question of preschool versus no preschool experience.

This study was designed to evaluate the differential effects of five preschool intervention programs through batteries of standardized tests administered prior to the intervention, following the preschool year, and one year later at the end of kindergarten. The classroom interventions were chosen on theoretical as well as practical bases to represent levels of structure along a continuum from the traditional nursery to the highly structured preschool. The nature of teacher-child interaction was considered to be the critical dimension of structure: as the specificity and intensity of this interaction increases so does the degree of structure. Two programs (Traditional and Community-Integrated) represented the less structured end of the continuum; a third (Montessori) embodied an established theory which includes much that can be identified with a child-centered or traditional approach and a methodology which incorporates considerable structure; the fourth (Ameliorative) and the fifth (Direct Verbal) programs fell at the highly structured end of the continuum.

METHOD

The Five Programs of Preschool Intervention

During the first year of the study, 75 disadvantaged children, five class units of 15 children each, participated. Two class units were assigned to the Traditional program, two to the Ameliorative program[1], and one class unit to the Direct Verbal program. In the second year, an additional class unit (16 children) was enrolled in the Direct Verbal program. Double class units were assigned to these three programs because follow-up studies are to continue through the early elementary grades and attrition was expected. During the second year of the study, a class unit of 16 children was enrolled in each of the remaining intervention programs (Community-Integrated and Montessori).[2]

Since the effects of specific classroom interventions were the concern of this study, total impact programs were not considered and variables outside the classroom which may significantly alter the development of the child were not manipulated. All children received medical examinations, but intensive medical follow-up was not undertaken. All parents were offered occasional opportunities to visit classrooms, but no program required intensive parental involvement or provided instruction for parents. Lunch programs were not offered at any preschool. Children were bussed to school and attended daily sessions of approximately two hours and fifteen minutes for a period of no less than seven or more than eight months.

Two programs (Traditional and Ameliorative) were conducted by Karnes, and a class unit consisted of fifteen children and three teachers, a pupil-teacher ratio of 5:1. One qualified preschool teacher was available, and the other positions were filled by college graduates experienced in working with young children. All but one were certified teachers. An inservice training program was conducted for the Traditional teachers prior to the opening of preschool classes. Weekly inservice training sessions were held for the teachers in the Ameliorative program.

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[1] An initial evaluation of the Traditional and Ameliorative interventions, the first phase of this study, appears in Karnes, Wollersheim, Stoneburner, Hodgins, and Teska (1968).

[2] Limited funds required a reduction from two to one class unit for these two interventions, and so the size of a class unit was increased from 15 to 16 children to compensate for attrition. It was assumed that one additional child would not alter classroom dynamics or impair comparability of groups.

In the Direct Verbal program the pupil-teacher ratio of 5:1 was maintained during the first year. In the second year a teacher training program was operated in conjunction with the class and part of the teaching was done by graduate student teachers. One of the permanent staff members was a certified elementary teacher and two were certified high school teachers. On-the-job training for these experienced teachers and for the student trainees was under the supervision of Bereiter and Engelmann, the directors of the Direct Verbal program. Weekly meetings were held in addition to daily discussions among staff members.

The Montessori and Community-Integrated programs operated under the auspices of existing community institutions, and it was not feasible to modify their pupil-teacher ratios to conform to those of the other programs. The Montessori program employed a qualified Montessori teacher and one trained teacher-aide for the 16 children, a ratio of 8:1. The pupil-teacher ratio in the Community-Integrated preschools varied from 6:1 to 10:1. Qualified preschool teachers were employed at these centers. One center used mother-aides in addition to its professional staff.

The five programs of classroom intervention may be distinguished as follows:

1. Major goals of the Traditional nursery school program were to promote the personal, social, motor, and general language development of the children. Teachers were instructed to capitalize on opportunities for incidental and informal learning, to encourage the children to talk and to ask questions, and to stimulate their interest in the world around them. Music, story, and art activities were scheduled regularly each week, and special efforts were made to interest the children in books. Outdoor play was a part of the daily routine; indoor play focused on a doll and housekeeping center, a vehicle and block center, and a small toy center which featured puzzles, beads, puppets, books, and the like. Juice time, rest, show and tell, and the routine supervision of toileting and outdoor wraps completed the daily schedule.

2. The Community-Integrated program, operated at four neighborhood centers, provided a traditional nursery school experience similar to the one outlined above. These centers were licensed by the state and were sponsored by community groups, and classes were composed predominately of middle- and upper-class Caucasian children whose parents paid tuition which ranged from $18 to $40 a month. Two to four disadvantaged children from the research class unit of 16 attended morning or afternoon sessions at one of these four centers.

Socioeconomic integration was the pertinent variable rather than racial integration which was achieved in all programs.

Spontaneous verbal interactions represent critical opportunities for language development in the traditional nursery school since substantial periods of time are given to peer-initiated play. Language inadequacies of disadvantaged children might, therefore, sharply limit their progress in language development in such a setting. Central to the altered classroom dynamics in the Community-Integrated program was the presence of an advantaged-peer language model in addition to the teacher model provided in all programs. The high ratio of advantaged children assured that these children would determine the level of spontaneous verbalization. To the extent that children in a traditional nursery school acquire language from each other, the Community-Integrated program provided the optimum setting for verbal development.

3. The Montessori program was administered by the local society which had offered classes during the preceding three years. Staff and classroom materials met Montessori standards. The daily schedule began with a routine health check and toileting. The group then met "on the line" for conversation, songs, finger plays, and exercises. The following half hour was devoted to "spontaneous choice" of approved materials: templates and stylus, cylinder blocks, dressing frames, color and weight tablets, touch boards, counting devices. The Montessori teacher noted that this class of disadvantaged children required teacher-presentation of materials more often than was typical of other classes at the school. Spontaneous choice was followed by a second period on the line devoted to musical activities, stories, and games. A "practical life" demonstration followed: sponging exercises, fingernail care, cutting of fruits and vegetables, brushing hair and teeth. Juice time, toileting, the silence exercise, and tidying the classroom occupied the next half hour. The final ten or twenty minutes of the session were given over to playground activities or supervised short walks. Field trips received major emphasis: the fire station, the library, a shopping mall, a music store, a dog kennel, an art museum, a flower show, a farm.

The specific nature of the "prepared environment" raised the level of structure within the Montessori classroom beyond that of the two traditional programs. The Montessori teacher did not, however, maintain the high level of specific control over the actions of the children required by the teachers in the two highly structured programs. Structure in the Montessori program derived not from direct teacher-child interaction but from the prescribed manner in which the child learned from the materials.

4. In the Ameliorative program, manipulative and multisensory materials were chosen to provide the framework for eliciting the verbal responses necessary for language development which was considered to be a critical area of deficit for disadvantaged children. The basic concepts to be taught as well as the specific learning tasks were chosen because their mastery is requisite to successful academic performance in early elementary school.

Content to be learned was presented in a game format which employed manipulative materials but was structured by the teacher to require concurrent verbal responses. Teachers were instructed to accommodate their teaching strategy to the performance of the children on battery-one tests and to incorporate into their lesson plans the various facets of the language process embodied in the Illinois Test of Psycholinguistic Abilities.

Each class unit (N=15) was divided into three groups on the basis of Binet IQ with one teacher for each group. Groupings were flexible, however, so that children who needed extra supervision or instruction could be somewhat evenly distributed or children who did not perform according to test indications might be more appropriately placed. The daily schedule was divided into three 20-minute structured learning periods: math concepts, language arts and reading readiness, and science-social studies. A large room where the 15 children could gather for group activities was available; however, most of the instruction took place in relatively small cubicles off the main room. Each cubicle contained materials appropriate to one of the three content areas, and each teacher moved from one cubicle to another with her group of five children.

Since the teacher-child relationship is of primary importance in securing motivation and in providing opportunities for the reinforcement of learning, each group remained with the same teacher for the three structured learning periods, for juice, and for field trips. The low pupil-teacher ratio allowed for differentiation of instruction to provide a high success ratio for each child. Immediate correction of incorrect responses (often through the repetition of model sentences or through duplicate layouts of small manipulative materials) and reinforcement of appropriate responses (usually through praise) assured the children of their competencies in handling curricular requirements and enhanced their intrinsic motivation to learn. Frequent review extended content previously presented and provided opportunities to use further the vocabulary and sentence structures which had been taught.

Children were free to form their own peer groupings during the music period and during a brief period of directed play which stressed visual-motor activities such as puzzles, blocks, clay, nesting and stacking toys, and pounding sets. No use was made of outdoor play equipment or traditional preschool toys such as dolls, toy appliances, cars, or trucks. Concepts taught during the structured periods were reinforced during directed play and especially during the music period. For example, when body parts were introduced in science or counting in math, these concepts were stressed in songs and rhythmic activities during music.

The general goals of the social studies and science curriculum were to teach useful vocabulary, to develop skills of classification, to provide simple experiences in developing sensory discriminations and in observing natural phenomena. The curriculum began with a unit on body awareness and self-concept developed through the use of body exercises, songs, pre-cut unassembled figures, and body outlines of the children. A unit on family members and immediate home environment followed which used integrated pictures, rubber play people, and family puppets; clothing cut from catalogs and sorted according to body parts, family member, or season; furniture items cut from catalogs and sorted according to type or appropriate room; go-together pictures such as a hand and a mitten, a chair and a table. A kitchen science unit, through the demonstration of simple scientific principles, provided opportunities for careful observation and verbalization of what had been seen, heard, tasted, or touched. Basic vocabulary included *melt*, *boil*, and *freeze*; *dry* and *wet*; relative temperature words such as *cool*, *warm*, and *hot*; *dissolve*; taste words such as *sweet*, *sour*, and *salty*. Additional units in this curriculum were germination of seeds and plant growth, farm and wild animals, fruits, vegetables, community buildings and workers, vehicles, weather, seasons, and time sense.

Objectives of the math curriculum involved the development of basic number concepts, appropriate manipulative skills, and a useful vocabulary. The general areas included the identification of five geometric shapes; one-to-one matching and its relationship to copying patterns, matching quantity, and establishing sets and verifying their equivalency; dimensional terms and seriation; counting as a functional concept; the introduction of numerals as visual symbols; and beginning addition and subtraction with manipulative objects such as popsicle sticks, bottle caps, and peg boards.

Multiple copies of inexpensive books were the most important instructional material in the language arts and reading readiness curriculum. As the teacher read, each child held his own copy of the book; he learned to hold the book right-side-up, to turn the pages singly and in sequence, to associate the pictures with the story being read, to develop left-to-right progression, and to associate the printed symbol with meaning. In addition, the small group storytime provided opportunities for reinforcing and elaborating upon vocabulary previously taught; for both short and long range memory activities; for sequencing events to show cause and effect and time relationships; for making inferences and, on occasion, divergent responses. Finally, as the story was read, the child heard acceptable syntactical models and the familiar constructs of the language. He absorbed the rhythms and stresses of standard, informal English. This curriculum also included activities which developed visual-motor coordination and which emphasized the rather fine visual and auditory discriminations requisite for reading readiness.

Language development received major emphasis throughout the day and especially during the three structured periods.

Verbalizations in conjunction with the manipulation of concrete materials were considered to be the most effective means of establishing new language responses. The game format (card packs, lotto games, models and miniatures, sorting, matching, and classifying games) created situations where verbal responses could be made repeatedly in a productive, meaningful context without resorting to rote repetition; often the child could visually and motorically assess the correctness of his thinking before he made an appropriate verbalization. If the child was unable to make a verbal response, the teacher supplied an appropriate model; when he began to initiate such responses, the teacher had the opportunity to correct, modify, and expand his verbalizations.

5. In the Direct Verbal program[3] intensive oral drill in verbal and logical patterns was chosen as the mode for instruction since disadvantaged children were considered adequate in perceptual and motoric skills but inadequate in verbal and abstract skills. A deliberate effort was made, therefore, to minimize the use of visual and manipulative materials. The curriculum was developed from a study of task requirements.

The children were divided into three groups of approximately five each, initially on the basis of Stanford-Binet IQ scores but later on the basis of teacher evaluation of the children's ability to learn, retain, and process what was taught. Each of the three teachers conducted a major learning period (language, arithmetic, or reading) for the three groups. A fourth teacher worked with children whose performance was too low to permit them to keep up with the instructional groups. Initially three children were in this group.

The major emphasis of the daily schedule was on three, twenty-minute, small group instructional sessions. These sessions were represented to the children as work rather than play. The child's responsibility was to speak when called upon, to try hard to give the correct responses, and to refrain from diversionary activities such as social play or running around the room. Adherence to these behavioral rules was rewarded by verbal praise, fortified during the first month with cookies. Children were reprimanded for deviations from the rules and, if this was not effective, were excluded from the instructional group for short periods of time. Every effort was made to keep the instructional sessions lively and enjoyable and to shift the basis of motivation to the children's own accomplishments and progress as improvement became demonstrable.

The general instructional strategy in the three subjects was that of rule followed by application. A verbal formula was learned by rote and then applied to a series of analogous examples of increasing difficulty. Tasks were initially presented in a highly structured form that provided a maximum of syntactical and presentational prompts; then the task was systematically "destructured" to remove these prompts and admit the variations in presentation that would be encountered in normal situations.

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[3] The Direct Verbal program descriptions for both years were written with Mrs. Jean Osborn who has been with that program since its inception. A more detailed account of this intervention is found in Bereiter and Engelmann (1966) and in Bereiter (1967).

The language program focused on minimum essentials of language competence which were identified as the logical requirements of a communication system that permits academic teaching to go on rather than on the basis of frequency of use. The objective was a kind of basic English that teacher and child may use in the conduct of elementary education--a basic English, therefore, which does not embody all the concepts a child should master but which provides a medium through which those concepts may be learned.

Since learning the rules of language and logic is a matter of grasping and generalizing analogies, the program was structured to dramatize those analogies. Rather than grouping concepts on the basis of thematic associations (concepts related to school or zoo), they were grouped on the basis of rules governing their manipulation. Thus polar sets of diverse content (big-little and hot-cold) were taught as parts of a single sequence, so that the child grasped the major principle governing such sets: If something is not one member of the set, it is the other member of the set. Maximizing the number of monitored responses that each child made in a class period was considered to be the critical tactical problem in teaching language to disadvantaged children.

The language program at the outset required only that the child be capable of making an attempt to imitate what was said to him. The process began by teaching a basic identity statement applied to familiar objects: "This is a ________. This is not a ________." When this statement was mastered (and mastery of the not-statement was a major challenge to many seriously deprived children), new language patterns were introduced: plurals, polar and non-polar sets, prepositional phrases, sub-class nouns, active verbs, common tenses, and personal pronouns. The remainder of the language program was devoted largely to if-then statements in which the major problems are logical ones concerning the use of all, only, some, and or. The program culminated in the use of language for deductive reasoning.

The teacher implemented the language program through a basic verbal repertoire which represented a hierarchy of task difficulty:

Verbatim repetition

Teacher: This block is red. Say it.
Children: This block is red.

Yes-No questions

Teacher: Is this block red?
Children: No, this block is not red.

Location tasks

Teacher: Show me a block that is red.
Children: This block is red.

Statement production

Teacher: Tell me about this piece of chalk.
Children: This piece of chalk is red, etc.

Teacher: Tell me about what this piece of chalk is not.
Children: This piece of chalk is not green, etc.

Deduction problems

Teacher: (With piece of chalk hidden in hand) This piece of chalk is not red. Do you know what color it is?
Children: No. Maybe it is blue; maybe it is yellow.

Since the arithmetic of natural numbers legitimately can be reduced to counting operations, the arithmetic program emphasized a "science of counting" without reference to phenomena that can be interpreted arithmetically. The disadvantaged child was assumed to lack the verbal and logical sophistication necessary to abstract arithmetic principles from everyday experiences, a sophistication required by "activity methods" of teaching arithmetic. Experiential referents were utilized later in the gradual destructuring of tasks.

After the initial teaching of counting, arithmetic was taught through equations emphasizing the idea that any equation could be read as a statement of fact and also as an instruction that told how the fact could be established through a counting operation. Thus, an equation ($3 \times 4 = 12$) could be read as the statement of fact (Three times four equals twelve.) and as an operational rule (If you count by three's four times, you end up with twelve.). The introduction of an unknown ($3 \times b = 12$) created a question (Three times how many equals twelve?), and the operation for finding the answer created a question (Count by three's how many times to end up with twelve?). Analogous statements and operations were used for addition, subtraction, and division (expressed by fractions).

The kind of pattern drill used in the language program to teach basic grammatical rules was also used in arithmetic. Again the child learned to generalize to new instances through drill on a sufficient number of analogous instances. Pattern drills were used to teach the "plus zero" rule (One plus zero equals one, two plus zero equals two, eight plus zero equals eight.), the "plus one" rule, and finally the operation for working up from a given number plus zero to the given number plus a given addend (What's eight plus three? If eight plus zero equals eight, eight plus one equals nine, eight plus two equals ten, and eight plus three equals eleven.).

The children were taught to read with a modified Initial Teaching Alphabet. The innovations, which were introduced primarily with the low performing children, had to do with the formation of long-vowel sounds and the convention for blending words. The following symbols designated long-vowel sounds: ā, ē, ī, ō and helped the child "spell" or sound out a variety of long-vowel words. After the children learned these words (sō, hē, sāve, fīne), the diacritical mark was dropped without grossly changing the total configuration of the word.

To help the children learn how to blend sounds, a skill which many disadvantaged children fail to master after years of reading instruction, only continuous-sound words (*fan*, not *ban* or *tan*) were introduced initially. The children were taught how to proceed from letter to letter without pausing. In sounding out words in this manner, the children were actually saying the words slowly and could see the relationship between the slowly produced word and the word as it is normally produced. To assure adequate performance in blending, the children were given say-it-fast drills with spoken words. ("Say it fast and I'll show you the picture: te-le-phone.")

As early as possible, the children were introduced to controlled-vocabulary stories written by the reading staff. After reading them, the children took them home. Taking stories home functioned as an incentive.

These three academic periods occupied half of the school session. The other half was intended to amplify and reinforce what had been learned. The initial ten-minute period was generally used by the children for working puzzles, playing with a miniature house and its furnishings, or in casual conversations with teachers. Snack time was brief and the only teaching involved was the identification of the color of the fruit drink served. Songs were especially written for the singing period which lasted fifteen to twenty minutes and were scheduled to provide practice in language operations which had been taught: singular and plural forms, classification ("If it's a truck, then it's a vehicle," sung to the tune of "Old Gray Mare"), and reversal of elements in phrases. Because of the importance attached to this practice, children were required rather than merely encouraged to sing. Story-telling also provided additional practice in language operations and involved more question-and-answer activity than is common in reading stories to children.

Selection of Subjects

The subjects for this study were selected from the preschool population of the economically depressed neighborhoods of Champaign-Urbana, a community of 100,000 in central Illinois. Families judged by public aid and school authorities to be economically and educationally deprived were canvassed for children who had no previous preschool experience and who would be four years old before the first of December, an age appropriate for enrollment in public kindergarten the following year. This age criterion was established so that follow-up evaluations could be more efficiently coordinated with the public schools. A home interviewer determined final eligibility for the program after she had completed a detailed family history. In addition, interviewers canvassed certain acutely disadvantaged sections of the city to locate children new to the community or otherwise unknown to the referring agencies.

The 1960 Stanford-Binet Intelligence Scale was administered to eligible children who were then stratified on the basis of their intelligence quotients into three groups: IQ scores 100 and above, 90 through 99, and 70 through 89.[4] The children were assigned to class units (N=15) in which one-third of each class consisted of children who had scored in the "high" IQ range; one-third, the "middle" range; one-third, the "low" range. Mean intelligence quotients were then computed for the three strata and for each class unit. These means were evaluated for comparability between class units as a whole and for strata between classes. These strata insured a balanced range of intelligence scores in each class unit and provided an opportunity to evaluate the effectiveness of the various programs on children from different ability groups. The mean IQ (approximately 95) of children placed in classes is, of course, higher than the mean of children screened.

Class units were examined to assure comparability of sex and race. When necessary, substitutions were made between classes to maintain an approximate ratio of 67% Negro children and 33% Caucasian children and a ratio of approximately 50% male and 50% female children. Finally, each class unit was randomly assigned to a particular intervention program. The initial composition of the groups is summarized in Table 1.

Evaluation Procedures

Since the intent of this study was to evaluate over a two-year period the effectiveness of five classroom interventions upon the over-all school readiness of disadvantaged children,

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[4] Two children with IQ's below 70 (69 and 67) were included in the study.

Table 1

Initial Group Composition

Group	N*	Mean Binet CA	Mean Binet IQ	Intelligence Strata Means						Race		Sex	
				High	N	Middle	N	Low	N	Caucasian	Negro	M	F
Traditional	25	52.4	94.4	108.6	7	93.9	10	82.6	8	9	16	15	10
Community-Integrated	16	48.7	93.3	105.2	6	95.0	5	77.4	5	5	11	7	9
Montessori	13	49.8	93.4	106.3	3	94.0	6	82.8	4	4	9	8	5
Ameliorative	24	52.1	96.2	107.0	8	95.7	9	84.6	7	7	17	11	13
Direct Verbal	23	50.6	94.6	108.1	7	93.5	8	83.8	8	7	16	9	14

*Twenty-two children withdrew from the programs before the end of the second year (battery three), and no data for these children are included in this study.

evaluations were made prior to the intervention, at the end of the preschool year, and at the end of the kindergarten year in the following areas:

1. Intellectual functioning as measured by the 1960 Stanford-Binet Individual Intelligence Scale, Form L-M.

2. Language development as measured by the Illinois Test of Psycholinguistic Abilities, experimental edition, 1961.

3. Vocabulary comprehension as measured by the Peabody Picture Vocabulary Test.

In addition, the Frostig Developmental Test of Visual Perception and the Metropolitan Readiness Tests were administered at the time of the second and third batteries. Qualified psychological examiners administered the tests at a school site and were not informed of the program assignments of the children.

RESULTS AND DISCUSSION AT THE END OF THE PRESCHOOL YEAR

Statistical Procedure

Statistical treatment of the total battery data (Binet, ITPA total, Peabody, Frostig, and Metropolitan) employed a multivariate analysis of covariance using initial Binet, ITPA total, and Peabody scores as covariates. Since initial Frostig data were not obtained for all groups and since the Metropolitan was not given until the end of the first year, scores from these instruments were not available for use as covariates. A separate multivariate analysis of covariance of ITPA subtest data used the initial scores from the nine subtests as covariates. When multivariate F's were significant, Newman-Keuls tests at the .05 level were conducted in those instances when univariate F's were also significant.

Total Battery

The F ratio for the multivariate test of equality of mean vectors for the six instruments in the test-two battery was significant at the .0001 level (Table 2). Univariate F's indicated significant differences among the five groups in Binet IQ, Peabody IQ, Frostig PQ, Metropolitan Number Readiness raw score and ITPA total language age difference score. There were no significant differences among the groups on the Metropolitan Reading Readiness raw score.

Intellectual Functioning

Clearly, the performance of the Ameliorative and Direct Verbal groups on the test-two Stanford-Binet was superior to the performances

Table 2

Total Battery Multivariate Analysis of Covariance
Five Groups for One Year

F ratio for multivariate test of equality of mean vectors = 3.8307

df = 24 and 308 P less than .0001

Variable	Between Mean Square	Univariate F	P less than
Binet IQ	299.7921	5.7219	.0004
Peabody IQ	352.9519	2.5625	.0435
Frostig PQ	1158.0615	9.2726	.0001
Metropolitan Reading Readiness Test Raw Score	41.2871	.9074	.4631
Metropolitan Number Readiness Test Raw Score	108.7465	8.3765	.0001
ITPA Total Language Age Difference Score*	139.1513	5.1118	.0010

NOTE: Initial Binet IQ, Peabody IQ, and ITPA total language age difference score (in months) were used as covariates.

*To relate language age to chronological age, a difference score (in months) was computed by subtracting a child's chronological age at the time of testing from his language age.

of the other three groups (Table 3). Although the Traditional group was not significantly lower than the Ameliorative or Direct Verbal group, neither was it significantly higher than the Community-Integrated or Montessori group. Initially the IQ scores of one-third of the children in each intervention group placed them in high strata, 100 and above. On test two 92% of the children in the Ameliorative group and 74% of the children in the Direct Verbal group fell in this stratum while only 31 to 54% of the children in the other three groups earned such scores. The two children in the Ameliorative group who were not in the high stratum scored 96 and 98 on test two and had initially scored in the low stratum. No child in the Direct Verbal group remained in the low stratum. Not only did significant numbers of children in the other three programs fail to score 100 at the time of test two, but 15 to 31% fell in low strata, 89 and below.

An examination of the distribution of IQ gains (Table 4) contributes to a fuller understanding of differences in group performance. Approximately 70% of the children in the two highly structured programs (Direct Verbal and Ameliorative) made gains of 10 or more points; only 30 to 40% of the children in the other three groups made gains of that magnitude. No child in the Ameliorative and Direct Verbal programs failed to make a gain. Fifteen to twenty-four percent of the children in the other three groups scored lower on test two than on test one.

The distribution data reflect one of the most important findings of this study: The two highly structured programs had a positive effect on the IQ score of every child in attendance, and one must assume that these two programs provided unique opportunities for enhancing the level of intellectual functioning with remarkable consistency. In the Ameliorative program, structure predicated active involvement of teacher and child. Through manipulative experience, the child moved to physical mastery of a concept and was required by the teacher to make appropriate verbalizations. Moving from structured, physical involvement within a meaningful, productive context to independent, conceptual verbalizations is appropriate to intellectual development. The teacher monitored the child's manipulative performances and assessed the adequacy of his verbal responses so that she could alter the learning situation appropriately. It was the function of the teacher to provide sufficient repetition to establish new verbal responses and to alter the learning task to encompass further cognitive and verbal complexities. The children in the Direct Verbal group, through intensive teacher-child interaction characterized by oral pattern drill in verbal and logical operations, mastered the basic elements of a communication system designed to provide a medium through which instruction would continue. This procedure, radically different from that of the Ameliorative program, proved to be equally successful in enhancing intellectual functioning. In the other three programs a variety of learning experiences was made available to the children, but their involvement in specific

Table 3

Stanford-Binet Mean IQ
Five Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	94.4	8.2	102.6	- 8.96
Community-Integrated	16	93.3	5.1	98.4	-12.16
Montessori	13	93.4	6.4	99.8	-12.52
Ameliorative	24	96.2	13.8	110.0	- 3.84
Direct Verbal	23	94.6	13.0	107.6	- 4.74

NOTE: Initial Binet IQ, Peabody IQ, and ITPA total language age difference score (in months) were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	M	C-I	T	DV	A
	-12.52	-12.16	-8.96	-4.74	-3.84

Differences

		C-I	T	DV	A
M		.36	3.56	7.78*	8.68*
C-I			3.20	7.42*	8.32*
T				4.22	5.12
DV					.90
Table Value		2.81	3.38	3.71	3.94
Corrected Table Value		4.68	5.63	6.18	6.56

$\sqrt{MS_{\text{within}}/\text{harmonic mean}} = 1.665$

*Significant difference at .05 level

Summary:

1. The Ameliorative and Direct Verbal groups, which were not significantly different from each other, were significantly higher than the Montessori and Community-Integrated groups.
2. The Traditional group was not significantly higher than the Montessori and Community-Integrated groups or significantly lower than the Direct Verbal and Ameliorative groups.

Table 4

Distribution of IQ Gains
Test 1-2 (Preschool Year)

Test 1-2 Gain in IQ Points	Group									
	Traditional N=25		Community-Integrated N=16		Montessori N=13		Ameliorative N=24		Direct Verbal N=23	
	%	N	%	N	%	N	%	N	%	N
25 to 29	0	0	12	2	0	0	8	2	4	1
20 to 24	8	2	6	1	0	0	12	3	17	4
15 to 19	20	5	0	0	15	2	21	5	22	5
10 to 14	12	3	12	2	23	3	29	7	30	7
5 to 9	28	7	6	1	31	4	25	6	9	2
0 to 4	12	3	38	6	15	2	4	1	17	4
- 1 to - 5	20	5	12	2	0	0	0	0	0	0
- 6 to -10	0	0	6	1	15	2	0	0	0	0
-11 to -15	0	0	0	0	0	0	0	0	0	0
-16 to -20	0	0	6	1	0	0	0	0	0	0

NOTE: IQ gains (test 1-2) by race-sex categories are found in appendix A.

experiences was not required and verbal responses were not insisted upon. Individual children in these programs did indeed make gains equal to and greater than the highest gain made by any child in either structured program. However, the number of children who made these excellent gains is overshadowed by the percentage who made minimal gains and regressions.

The distribution of gains in the Community-Integrated group merits comment, particularly since this was the only intervention in which disadvantaged and advantaged children were integrated. Sixty-two percent of the disadvantaged children in this group made minimal gains (0-4 points) or lost IQ points. At the other extreme, three children (18%) made very large gains and were essentially responsible for the mean gain of the entire group.[5] Since the Community-Integrated and Traditional programs provided similar experiences, one would expect a parallel distribution of gains. Since this was not the case, it is reasonable to assume that the atypical distribution was produced by altered classroom dynamics: the presence of the advantaged children as the majority group.

The disadvantaged children in the Community-Integrated setting remained somewhat uninvolved in certain critical aspects of the program. This was particularly true in the quasi-structured areas of the daily schedule which involved language: show and tell, music, storytime, and discussions at circle time which included the calendar and easel-pictures. The disadvantaged children typically sat in the fringe area at storytime and were observed to remain aloof or to attend absentmindedly. Observers recorded: "Played with the shadows made from his fingers throughout the story. Fiddled with the folds in the window curtains while the story was read. Sat with his rug on his head during presentation of the easel-picture." During music they were observed "making the motions but not singing the words." Neither the teachers of the Community-Integrated group nor the advantaged children rejected the disadvantaged children. In fact, these teachers were seen as giving the disadvantaged children more than their share of attention. It is fair to add, however, that this attention was sometimes given to the acting out or aggressive child rather than to the aloof or uninvolved child.

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[5] No obvious characteristic of these three children or their group placement seems to have been related to their high gains. A particular community preschool did not account for these gains since each of the three attended a different preschool. Their racial distribution was the same as that of their intervention unit, two Negro and one Caucasian. There were two females and one male, and there was one child from each of the three intelligence strata.

The disadvantaged children functioned adequately in areas of the daily schedule which emphasized large motor development and social skills and sought these areas for themselves. The block and vehicle center was popular with the boys as was the doll and housekeeping center with the girls. Even in these areas, however, the disadvantaged child's verbal functioning was minimal. One girl, for instance, played house happily and well for an hour with a boy from the advantaged segment of the class. He spontaneously verbalized his play activity; she, however, cleaned the house, made breakfast, washed the dishes, and even packed his lunch without speaking. It is reasonable to conclude that the disadvantaged children sought situations in which they felt competent and avoided those in which they felt inadequate. It was obvious that verbal situations made them feel inadequate.

Since the spontaneous speech of the advantaged children was well developed, it is not surprising that the silence of the disadvantaged children went relatively unmarked by the Community-Integrated teachers. In other words, the songs were well sung, the easel-pictures and the calendar were developed in great verbal detail, but the dominant group, the advantaged children, were responsible for the success of these activities. In the Traditional group, however, these quasi-structured and basically verbal activities had to be sustained through the participation of disadvantaged children. In this setting the teachers were keenly aware of the language inadequacies of their group. The children could not avoid these situations or remain uninvolved because there were no other children to replace them in sustaining the activity. Implicit in the equipment, in the activities which make up the daily schedule, and in the philosophy of the traditional nursery school is the assumed middle-class background of the children: Four-year-old children enjoy listening to stories; four-year-old children spontaneously verbalize about their environment; four-year-old children talk freely during their play. The Community-Integrated teachers could operate effectively within these assumptions because the majority of their children met these expectations; the teachers in the Traditional program necessarily accommodated the operation of their program to the background and performance of the children.

Language Development

Evaluation of the effectiveness of the five programs in fostering the language development of disadvantaged children is the second major purpose of this study. The Ameliorative program emphasized the acquisition of specific verbal skills, and learning activities were structuredto emphasize the co-relation of cognitive and language development. Teachers incorporated into their lesson planning the various facets of the language process as embodied in the Illinois Test of Psycholinguistic Abilities (ITPA) and adjusted their teaching strategy to the test-one ITPA profiles of individual children. In contrast, the Direct Verbal curriculum did not include specific language skills because of their relation to the language model of the ITPA but because they met the logical criteria of the minimum essentials of language competence. The opportunities for language development in the Traditional program occurred in more general ways, specifically in quasi-structured activities such as show and tell, circle time, music, and in spontaneous situations arising from play. The influence of peer language models should have been more important for the Traditional group than for the two structured groups which had fewer opportunities for spontaneous language. Situations affecting language development in the Community-Integrated program were similar to those operating within the Traditional group but were most obviously altered by the introduction of peer language models from an advantaged segment of the population. Finally, the Montessori program focused on motor-sensory learning as the basic mode in which conceptual and linguistic abilities occur, following the pattern of the child's sensorial development.

Comparisons among groups on the basis of language age scores obtained from the ITPA are confounded by slight differences in the initial mean chronological ages of the groups and slight variations in test intervals (Table 5). To compensate for these variations and to relate language age scores to chronological age, a difference score was computed by subtracting a child's chronological age at the time of testing from his language age score. For example, a child who was 48 months old at the time of test one and earned a language age score of 40 months on a given subtest would receive a difference score of -8 months; that is, he had a deficit of 8 months on that subtest. Statistical treatment of the data was conducted on and is reported for these difference scores. It must be kept in mind that a difference score gain of five months between test one and test two would represent, for example, thirteen months of change in language age score: five months reduction of deficit plus eight

Table 5

Mean Chronological Age in Months
at the Time of ITPA Testing

Group	N	Test 1	Interval	Test 2
Traditional	25	53.4	6.9	60.3
Community-Integrated	16	49.3	8.6	57.9
Montessori	13	50.2	8.2	58.4
Ameliorative	24	52.6	7.7	60.3
Direct Verbal	23	51.1	8.3	59.4

months of gain required by the interval between tests. Children who scored below the norms provided in the Examiner's Manual were arbitrarily assigned the lowest language age score of that subtest.

Since the intelligence strata design used in this study produced an inflated Binet IQ mean compared to the mean of the disadvantaged children screened, it is reasonable to assume that this procedure would also produce inflated ITPA means; and it is not surprising to discover that these means do not indicate deficits in all subtests of the ITPA. The disadvantaged children in the five groups in this study, as well as the children in other groups throughout this project, consistently demonstrated major initial deficits on three subtests: Vocal Encoding, Auditory-Vocal Automatic, and Auditory-Vocal Association. In addition to the specific aspects of language functioning measured, the ability to express oneself verbally is the common requisite for successful performance on these three subtests. These sharply limited verbal expressive abilities, reflective of a verbally impoverished environment, are the crucial challenge to which preschool intervention programs regardless of strategy or orientation must be addressed, and the relative performances of the five groups on these three subtests are critical to program evaluation.

The F ratio for the multivariate test of equality of mean vectors for the nine ITPA subtests was significant at the .0001 level (Table 6). Univariate F's indicated significant differences among the five groups on five subtests including the three subtests which reflected the major area of initial deficit--verbal expressive ability.

The Ameliorative, Traditional, and Direct Verbal groups made good progress (8 to 12 months) on the Vocal Encoding test, and their test-two performances were essentially nondeficit (Table 7). The Community-Integrated and Montessori groups obtained lower scores on test two than on test one and made regressions of five and three months respectively. The Ameliorative, Direct Verbal, and Traditional groups did not differ significantly from each other, but were significantly higher than the Community-Integrated and Montessori groups.

On the Auditory-Vocal Automatic test the Ameliorative group clearly made the greatest progress and was the only nondeficit group at the time of test two (Table 8). The Ameliorative group was significantly higher than the Community-Integrated and Montessori groups and very nearly statistically higher than the Direct Verbal group. The Montessori group was significantly lower than the other four groups. The magnitude of its regression (10 months) is particularly striking and resulted from a raw score mean which was, in fact, lower on test two than it had been on test one.

Table 6

ITPA Subtest Multivariate Analysis of Covariance
Five Groups for One Year

F ratio for multivariate test of equality of mean vectors = 3.0810

df = 36 and 298 P less than .0001

Variable	Between Mean Square	Univariate F	P less than
Auditory-Vocal Automatic	756.8685	6.3623	.0002
Visual Decoding	305.2037	1.4825	.2145
Motor Encoding	413.1699	1.7864	.1389
Auditory-Vocal Association	380.9284	5.2065	.0009
Visual-Motor Sequencing	106.0372	.9494	.4396
Vocal Encoding	735.6577	5.7654	.0004
Auditory-Vocal Sequencing	317.6089	2.8698	.0277
Visual-Motor Association	914.5945	5.1614	.0009
Auditory Decoding	169.1533	.9748	.4256

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

Table 7

Vocal Encoding Test
Mean Language Age Difference Score in Months
Five Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	-15.1	10.8	- 4.3	41.38
Community-Integrated	16	- 8.2	- 4.7	-12.9	31.95
Montessori	13	-12.6	- 2.7	-15.3	29.85
Ameliorative	24	-14.7	11.7	- 3.0	46.73
Direct Verbal	23	-11.3	8.0	- 3.3	41.81

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	M	C-I	T	DV	A
	29.85	31.95	41.38	41.81	46.73
Differences					
M		2.10	11.53*	11.96*	16.88*
C-I			9.43*	9.86*	14.78*
T				.43	5.35
DV					4.92
Table Value		2.81	3.38	3.71	3.94
Corrected Table Value		7.30	8.78	9.64	10.24

$\sqrt{MS_{\text{within/harmonic mean}}} = 2.598$

*Significant difference at .05 level

Summary: The Ameliorative, Direct Verbal, and Traditional groups, which did not differ significantly from each other, were significantly higher than the Community-Integrated and Montessori groups, which did not differ significantly from each other.

Table 8

Auditory-Vocal Automatic Test
Mean Language Age Difference Score in Months
Five Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	- 8.4	4.0	- 4.4	-32.54
Community-Integrated	16	-14.1	- 1.0	-15.1	-38.56
Montessori	13	- 9.6	-10.2	-19.8	-46.50
Ameliorative	24	-12.1	12.4	.3	-26.57
Direct Verbal	23	-11.7	2.5	- 9.2	-34.98

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	M -46.50	C-I -38.56	DV -34.98	T -32.54	A -26.57
		Differences			
M		7.94*	11.52*	13.96*	19.93*
C-I			3.58	6.02	11.99*
DV				2.44	8.41
T					5.97
Table Value		2.81	3.38	3.71	3.94
Corrected Table Value		7.05	8.48	9.31	9.89

$\sqrt{MS_{\text{within/harmonic mean}}} = 2.509$

*Significant difference at .05 level

Summary:
1. The Ameliorative group was significantly higher than the Community-Integrated and Montessori groups but not significantly higher than the Traditional and Direct Verbal groups.
2. The Traditional, Direct Verbal, and Community-Integrated groups were not significantly different from each other.
3. The Montessori group was significantly lower than the other four groups.

On the *Auditory-Vocal Association* test only the Direct Verbal and Ameliorative groups were nondeficit on test two, and the Direct Verbal group was significantly higher than the other four groups (Table 9). Although there were no significant differences among these four groups, the deficit of the Ameliorative group was eliminated while the substantial initial deficits of the Community-Integrated, Montessori, and Traditional groups remained essentially unchanged.

Figure one emphasizes the parallel, regressive performances of the Community-Integrated and Montessori groups on the three subtests of major initial deficit. These two intervention programs apparently did little to enhance verbal expressive abilities. Observers who visited the Montessori classroom noted the lack of verbal expressive experiences: Children were busily engaged with motor-sensory materials for remarkably long periods of time, but silence prevailed. More opportunities for verbal expressive experiences existed in the Community-Integrated program; however, as noted previously, the disadvantaged children tended to withdraw from these situations.

The Traditional group, on the other hand, did relatively well on these three subtests. In two instances they made modest improvement (2 to 4 months) and substantial progress (11 months) in the third. When children participated in verbal expressive activities, as the dynamics of homogeneity required, they did indeed make gains.

The performances of the two highly structured groups were clearly superior to those of the other three. It seems reasonable to conclude that physical involvement alone, no matter how well programmed, sustained, and orderly (Montessori), did not foster the verbal expressive development of disadvantaged children. Neither did spontaneous or relatively unstructured opportunities for such development (Community-Integrated and Traditional) prove adequate. The major initial deficit of the Direct Verbal group was eliminated on two of the three subtests. The emphasis on polar concept drill seems clearly related to its gains in Auditory-Vocal Association. The required production of verbal responses (statement production drill) was effective in stimulating growth in Vocal Encoding. The failure of the Direct Verbal program to promote substantial growth on the Auditory-Vocal Automatic test is puzzling since repetitive oral pattern drill should have been a highly efficient means of incorporating appropriate grammatical constructs. The major initial deficit of the Ameliorative group was eliminated on each of the three subtests requiring verbal expressive abilities. When activities were structured to engage the child in physical manipulation while concurrent, meaningful verbalizations were elicited, verbal expressive abilities dramatically improved.

Table 9

Auditory-Vocal Association Test
Mean Language Age Difference Score in Months
Five Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	- 6.1	1.7	-4.4	-7.32
Community-Integrated	16	-11.1	1.5	-9.6	-9.36
Montessori	13	- 8.4	1.6	-6.8	-9.39
Ameliorative	24	- 5.9	6.5	.6	-4.47
Direct Verbal	23	- 9.8	12.6	2.8	1.23

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	M -9.39	C-I -9.36	T -7.32	A -4.47	DV 1.23
		Differences			
M		.03	2.07	4.92	10.62*
C-I			2.04	4.89	10.59*
T				2.85	8.55*
A					5.70*
Table Value		2.81	3.38	3.71	3.94
Corrected Table Value		5.53	6.65	7.30	7.75

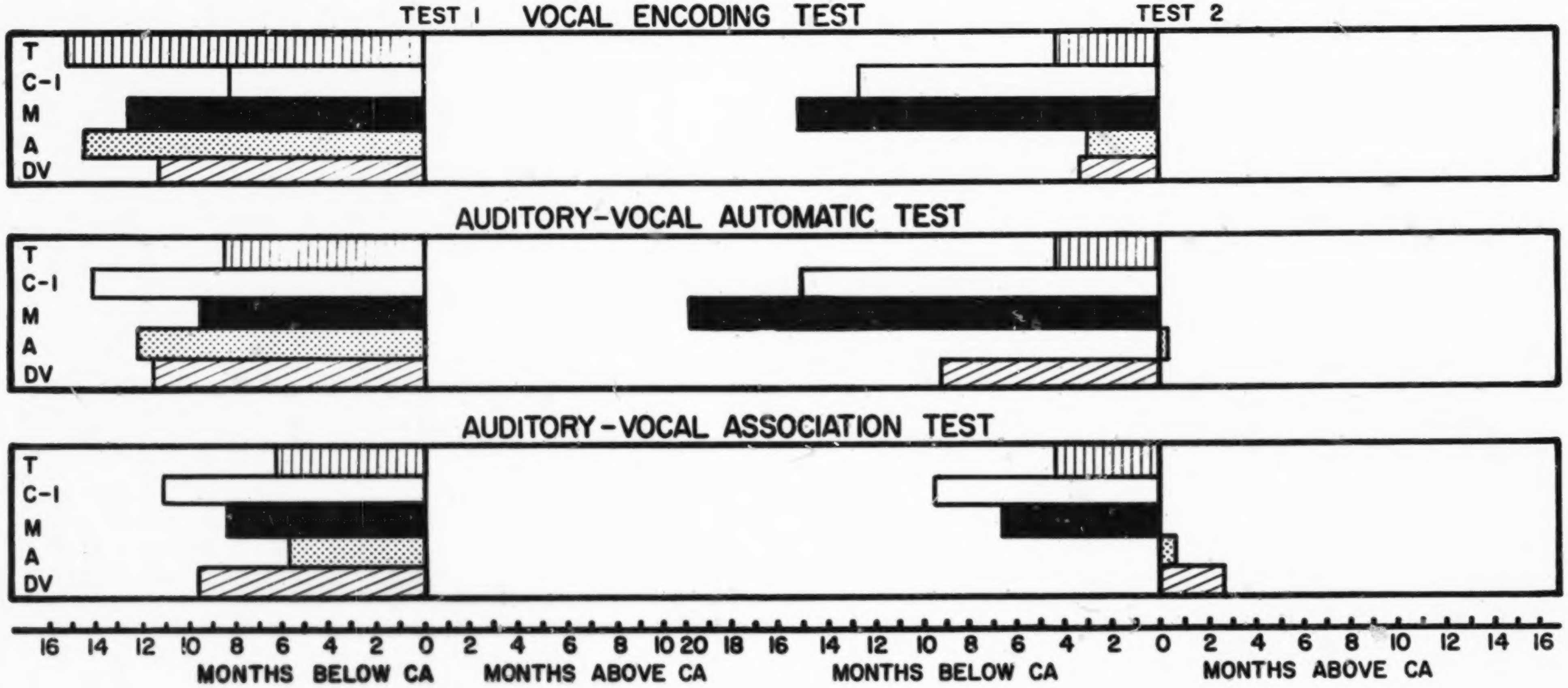
$\sqrt{MS_{\text{within}}/\text{harmonic mean}} = 1.967$

*Significant difference at .05 level

Summary: The Direct Verbal group was significantly higher than the other four groups which did not differ significantly from each other.

FIGURE I

DIFFERENCE SCORE MEANS FOR THE THREE ITPA SUBTESTS
IN WHICH THE FIVE GROUPS DEMONSTRATED THE GREATEST INITIAL DEFICIT



On three ITPA subtests the five groups tended to show relatively smaller initial deficits (3 to 6 months): Motor Encoding, Visual-Motor Sequencing, and Auditory Decoding. The univariate F's indicated no significant differences among the groups on these three subtests (Table 6).

Only the Community-Integrated and Direct Verbal groups failed to make progress on the Motor Encoding test (Table 10, Figure 2). The motoric involvement of the Community-Integrated children, noted previously, might have been reflected in this area; this was not the case. Since the Direct Verbal program emphasized patterned verbal interactions without motoric involvement, their failure to progress in this area is not surprising. Their small regression (2 months) is, however, of some concern. The sensory-motor activities provided in the Montessori program and the manipulative experiences which accompanied verbalizations in the Ameliorative program produced substantial and comparable gains (7 and 8 months respectively in excess of the program interval).

The results for the Visual-Motor Sequencing test are presented in Table 11 and Figure 2. With the exception of the Montessori group, all groups were functioning at their chronological age at test two. Differences in gains seem to relate to large differences in initial deficit rather than to specific program variables. The deficit initial performance of the Traditional and Ameliorative groups is not consistent with the nondeficit initial performance of the Community-Integrated and Montessori groups and the minor initial deficit of the Direct Verbal group. Furthermore, five other research class units established in subsequent years according to the procedures outlined in this report did not reveal major initial deficits in Visual-Motor Sequencing. Three of these five classes had no initial deficit; two had four month or relatively minor deficits. These data support the notion that the initial performance of the Traditional and Ameliorative groups was atypical. Since these two groups entered the program during the first year of the study and since this subtest is especially difficult to administer, it is not unreasonable to speculate that examiners subsequently became more proficient and that, therefore, children tested later obtained more valid initial scores. The three-month deficit of the Direct Verbal group represents a seven-month deficit for the class unit which entered the program with the Traditional and Ameliorative groups the first year and a two-month deficit for the class unit which entered the program with the Community-Integrated and Montessori groups the second year. This phenomenon existed on no other subtest.

Only the Montessori group failed to perform at or near its chronological age on the test-two Visual-Motor Sequencing test. These children, in fact, regressed, scoring 5 months below their mean chronological age. One might have assumed that the prominence given to sensory-motor activity in the Montessori program would have assured a continuing nondeficit performance. It is possible

Table 10

Motor Encoding Test
Mean Language Age Difference Score in Months
Five Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	-1.6	3.8	2.2	18.72
Community-Integrated	16	-3.7	.3	-3.4	13.67
Montessori	13	-6.1	7.3	1.2	18.94
Ameliorative	24	-8.2	8.3	.1	19.28
Direct Verbal	23	-6.8	-1.9	-8.7	8.50

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

FIGURE 2

DIFFERENCE SCORE MEANS FOR THE THREE ITPA SUBTESTS IN WHICH THE FIVE GROUPS DEMONSTRATED RELATIVELY SMALL INITIAL DEFICITS

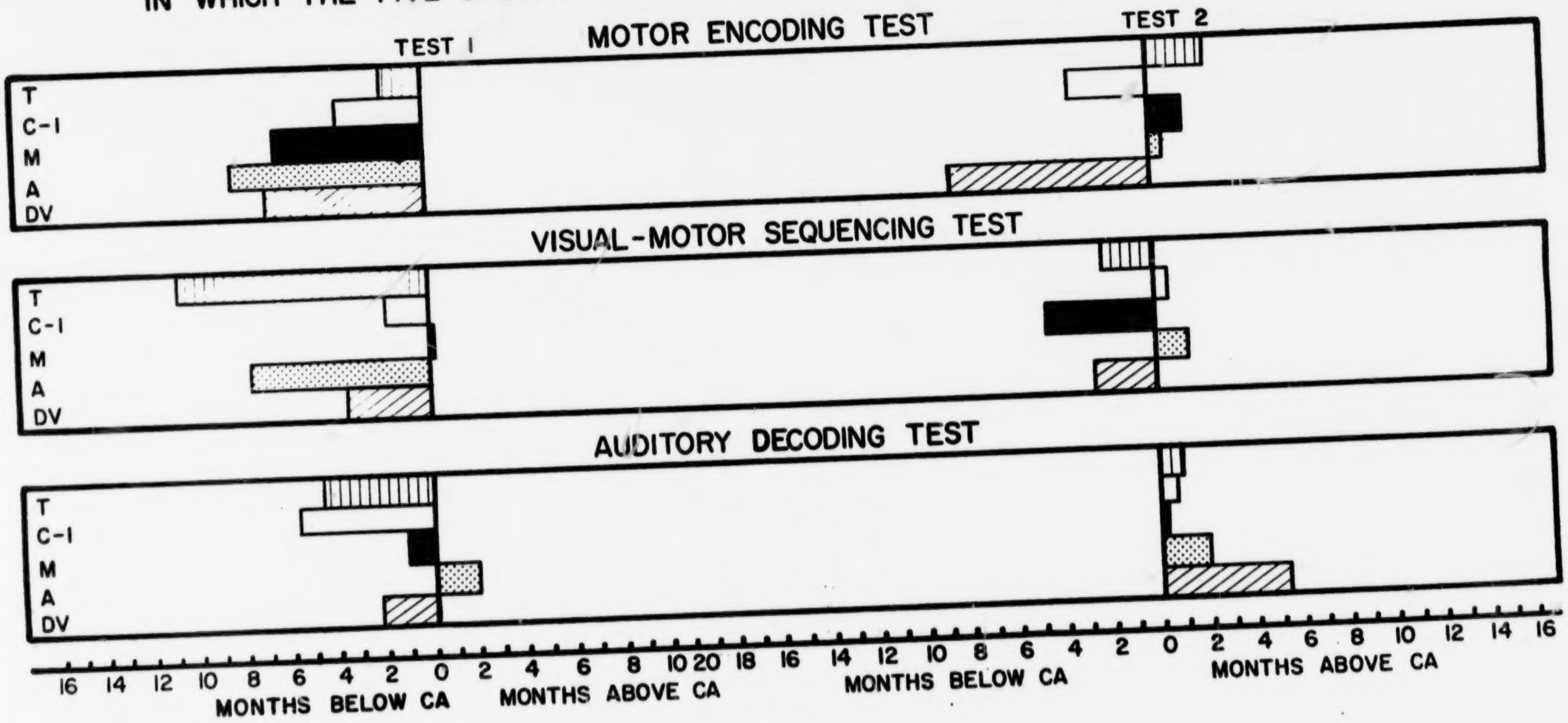


Table 11

Visual-Motor Sequencing Test
Mean Language Age Difference Score in Months
Five Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	-10.8	8.7	-2.1	57.38
Community-Integrated	16	- 1.9	2.3	.4	62.24
Montessori	13	.1	-5.0	-4.9	55.67
Ameliorative	24	- 7.7	9.1	1.4	60.71
Direct Verbal	23	- 3.3	.5	-2.8	58.03

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

that involvement with manipulative materials without specific and directed translation to verbal levels may limit, at least immediately, the development of sequential or memory-related skills. In other words, the child's ability to use verbal labels in his thinking may contribute to maximum performance on this test. Since successful performance on this test requires sustained attention to material and examiner, it is also possible that the rather solitary involvement of the Montessori children with materials may not have equipped them to sustain such attention while interacting with the examiner and their increased deficit may be a reflection of poor interaction rather than visual-sequential inadequacies. This regression is paralleled by a deteriorating performance on the other subtest requiring sequential abilities (Auditory-Vocal Sequencing, Figure 3) where sustained attention to the examiner is also required.

The five groups did not make significantly different progress on the Auditory Decoding test (Table 12, Figure 2). The Traditional, Community-Integrated, and Direct Verbal groups eliminated their modest initial deficits while the Montessori and Ameliorative groups again performed in a nondeficit manner. A discussion of program variables does not seem warranted since the groups made limited and nondifferential progress and all test-two performances were nondeficit.

On three ITPA subtests the five groups showed negligible or no initial deficits: Auditory-Vocal Sequencing, Visual-Motor Association, and Visual Decoding. The univariate F's indicated significant differences among the five groups on two of these three subtests, Auditory-Vocal Sequencing and Visual-Motor Association (Table 6).

Only the Ameliorative group made progress on the Auditory-Vocal Sequencing test (Table 13, Figure 3). The nondeficit performance of the Traditional and Direct Verbal groups remained unchanged. The Community-Integrated and Montessori groups made sizeable regressions (6 and 5 months respectively), and these regressions together with the progress of five months of the Ameliorative group accounted for the significant difference among the groups.

The regressive performance of the Community-Integrated and Montessori groups may be related to their relatively poor test-two performances on all tests requiring verbal interaction with the examiner (Vocal Encoding, Auditory-Vocal Automatic, and Auditory-Vocal Association). The gain of the Ameliorative group (5 months) on the Auditory-Vocal Sequencing test (digit repetition) probably relates to a teaching strategy which required the child to give specific verbal responses, often following a model supplied by the teacher. Although digit repetition was not taught, the opportunity for transfer from the specifics of the mathematics curriculum seems plausible. Verbal pattern drill and the mathematics curriculum in the Direct Verbal program provided similar

Table 12

Auditory Decoding Test
Mean Language Age Difference Score in Months
Five Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	-4.5	5.5	1.0	56.43
Community-Integrated	16	-5.9	6.7	.8	60.59
Montessori	13	-1.0	1.3	.3	56.61
Ameliorative	24	2.0	.0	2.0	54.90
Direct Verbal	23	-2.1	7.4	5.3	62.27

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

Table 13

Auditory-Vocal Sequencing Test
Mean Language Age Difference Score in Months
Five Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	2.5	- .3	2.2	-19.88
Community-Integrated	16	- .6	-6.5	-7.1	-27.40
Montessori	13	.1	-4.6	-4.5	-25.92
Ameliorative	24	1.6	4.9	6.5	-16.75
Direct Verbal	23	3.0	.9	3.9	-18.97

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	C-I	M	T	DV	A
	-27.40	-25.92	-19.88	-18.97	-16.75

Differences

C-I	1.48	7.52	8.43	10.65*
M		6.04	6.95	9.17*
T			.91	3.13
DV				2.22
Table Value	2.81	3.38	3.71	3.94
Corrected Table Value	6.80	8.18	8.98	9.54

$\sqrt{MS_{\text{within}}/\text{harmonic mean}} = 2.420$

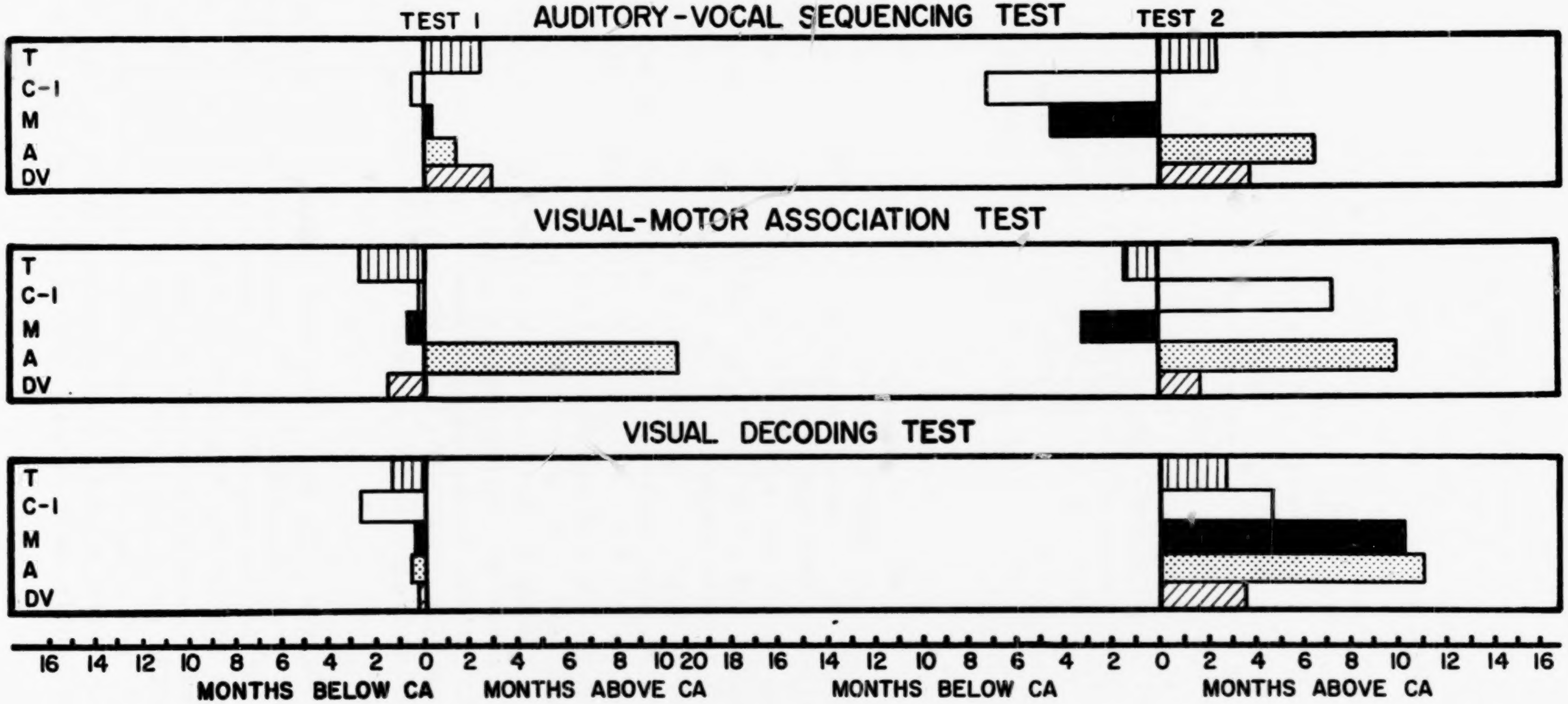
*Significant difference at .05 level

Summary:

1. The Ameliorative group was significantly higher than the Montessori and Community-Integrated groups but not significantly higher than the Direct Verbal and Traditional groups.
2. The Direct Verbal, Traditional, Montessori, and Community-Integrated groups were not significantly different from each other.

FIGURE 3

DIFFERENCE SCORE MEANS FOR THE THREE ITPA SUBTESTS IN WHICH THE FIVE GROUPS DEMONSTRATED LITTLE OR NO INITIAL DEFICIT



AUDITORY-VOCAL SEQUENCING TEST

VISUAL-MOTOR ASSOCIATION TEST

VISUAL DECODING TEST

opportunities; however, since this group initially scored three months above their chronological age, further acceleration was not to be expected.

On the Visual-Motor Association test the Ameliorative and Community-Integrated groups were significantly higher than the Traditional and Montessori groups (Table 14, Figure 3). The high test-two score of the Ameliorative group reflects its atypically high test-one performance rather than gains made during the preschool year and may not be attributed to the specifics of the intervention. The large gain (7 months) of the Community-Integrated group is consistent with its gain on a related subtest, Visual Decoding. Although integration with middle- and upper-class peers did not promote the development of language in the verbal expressive area, the development of reception and association in the visual channel was enhanced beyond the level attained by the Traditional group. Apparently, the enriched environment created by the presence of the advantaged children was not incorporated by the disadvantaged children at the verbal expressive level because they did not participate at this level but was incorporated at the visual level where participation may be experienced through observation.

All groups did well on the Visual Decoding test (Table 15, Figure 3), and the Ameliorative and Montessori groups made very large and comparable gains. The gain of the Ameliorative children placed them 11 months above their chronological age at the time of test two. The naming and labeling activities prevalent in the three curricula, especially activities which emphasized matching, sorting, and classification, may well have helped the Ameliorative group to make this gain. Such activities were scheduled to provide opportunities for vocabulary development and for more precise, expanded, and flexible use of language; however, the method of presentation relied heavily on visual materials. The use of manipulative and visually self-corrective materials in the Montessori program may have helped this group perform equally well on this subtest. These activities, however, did not similarly accelerate the performance of the Montessori group on the Visual-Motor Association test. At any rate, the Montessori group made substantial progress on the Visual Decoding test in marked contrast to its relatively static or regressive performance on seven of the subtests of the ITPA.

On the ITPA total the Ameliorative group was significantly higher than the Community-Integrated and Montessori groups but did not differ significantly from the Direct Verbal and Traditional groups (Table 16, Figure 4). The Direct Verbal and Traditional groups were significantly higher than the Montessori group only. The ITPA total, however, may obscure variations in group performance, and a meaningful summary requires a restatement of subtest data. Three groups, Traditional, Direct Verbal, and Ameliorative, consistently made gains. The Traditional group moved in a positive

Table 14

Visual-Motor Association Test
Mean Language Age Difference Score in Months
Five Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	- 2.6	.9	- 1.7	74.55
Community-Integrated	16	- .2	7.3	7.1	89.32
Montessori	13	- .8	-2.4	- 3.2	77.30
Ameliorative	24	10.9	- .9	10.0	91.39
Direct Verbal	23	- 1.6	3.3	1.7	82.65

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	T 74.55	M 77.30	DV 82.65	C-I 89.32	A 91.39
Differences					
T		2.75	8.10	14.77*	16.84*
M			5.35	12.02*	14.09*
DV				6.67	8.74
C-I					2.07
Table Value		2.81	3.38	3.71	3.94
Corrected Table Value		8.60	10.35	11.36	12.06

$\sqrt{MS_{\text{within}}/\text{harmonic mean}} = 3.062$

*Significant difference at .05 level

Summary:
1. The Ameliorative and Community-Integrated groups, which did not differ significantly from each other, were significantly higher than the Montessori and Traditional groups but not significantly higher than the Direct Verbal group.
2. The Direct Verbal, Montessori, and Traditional groups were not significantly different from each other.

Table 15

Visual Decoding Test
Mean Language Age Difference Score in Months
Five Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	-1.3	3.7	2.4	64.46
Community-Integrated	16	-2.8	7.4	4.6	67.79
Montessori	13	- .4	10.5	10.1	73.07
Ameliorative	24	- .6	11.6	11.0	74.43
Direct Verbal	23	- .3	3.8	3.5	66.86

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

Table 16

ITPA Total
Mean Language Age Difference Score in Months
Five Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	-5.4	4.3	-1.1	23.78
Community-Integrated	16	-6.3	1.1	-5.2	20.33
Montessori	13	-4.2	- .9	-5.1	19.02
Ameliorative	24	-3.7	6.3	2.6	25.96
Direct Verbal	23	-4.7	4.3	- .4	23.90

NOTE: Initial Binet IQ, Peabody IQ, and ITPA language age difference score (in months) were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	M	C-I	T	DV	A
	19.02	20.33	23.78	23.90	25.96
Differences					
M		1.31	4.76*	4.88*	6.94*
C-I			3.45	3.57	5.63*
T				.12	2.18
DV					2.06
Table Value		2.81	3.38	3.71	3.94
Corrected Table Value		3.37	4.06	4.45	4.73

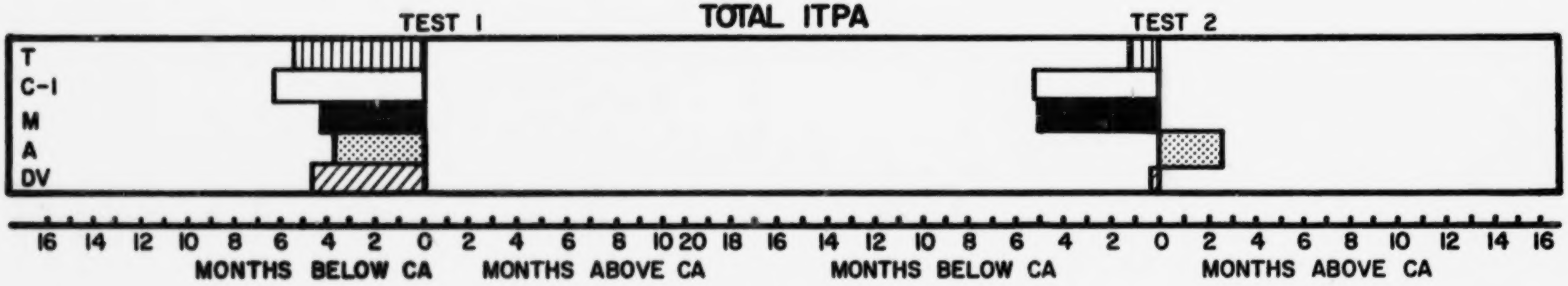
$\sqrt{MS_{\text{within}}/\text{harmonic mean}} = 1.200$

*Significant difference at .05 level

Summary:

1. The Ameliorative group was significantly higher than the Community-Integrated and Montessori groups but not significantly higher than the Direct Verbal and Traditional groups.
2. The Traditional and Direct Verbal groups were significantly higher than the Montessori group but not significantly higher than the Community-Integrated group.

FIGURE 4
ITPA TOTAL DIFFERENCE SCORE MEANS
FIVE GROUPS FOR ONE YEAR



direction on eight of the nine subtests. The range of this upward movement was from .9 to 10.8 months, and on three of these eight subtests the gain exceeded 4.6 months.[6] Its one loss was .3 months. The Direct Verbal group also moved in a positive direction on eight of the nine subtests. The range was from .5 to 12.6 months, and on three of these eight subtests the gain exceeded 4.6 months. Its one regression was 1.9 months. The Ameliorative group moved in a positive direction on seven of the nine subtests. The range of this upward movement was 4.9 to 12.4 months, and on all of these seven subtests the gain exceeded the median. On one subtest there was no change and a loss of .9 months occurred on the other.

The Community-Integrated and Montessori groups did not consistently move in a positive direction, reflecting a pattern of more moderate gains and losses. On six of the nine subtests the Community-Integrated group made gains ranging from .3 to 7.4 months; in three instances these gains exceeded 4.6 months. On three subtests, however, the Community-Integrated group demonstrated regressions which ranged from 1.0 to 6.5 months, and in two instances these losses exceeded 4.6 months. The Montessori group moved in a positive direction on four of the nine subtests with gains ranging from 1.3 to 10.5 months. Two of these gains exceeded the median. On five subtests, however, the Montessori group demonstrated regressions from 2.4 to 10.2 months, and in two instances these losses exceeded 4.6 months.

The magnitude of the gains of the Ameliorative group and the consistency with which they were achieved resulted in an essentially nondeficit test-two performance. The Direct Verbal and the Traditional groups made consistent but more modest gains and performed comparably on all subtests with the exception of Auditory-Vocal Automatic and Motor Encoding where substantial deficits remained for the Direct Verbal group. The Community-Integrated and Montessori groups, on the other hand, generally made smaller gains than the other three groups and made gains less consistently. The performance of the Montessori group tended to be somewhat regressive while that of the Community-Integrated group was more nearly static.

A discriminant analysis was conducted with the ITPA subtest data to provide additional information regarding the differential performances of the five groups. The results of this analysis generally confirm the previous discussion. The first function was primarily weighted by those subtests which reflect verbal expressive abilities and on which all groups were substantially deficit initially (Vocal Encoding, Auditory-Vocal Automatic, and Auditory-Vocal Association) and by one additional subtest, Auditory-Vocal Sequencing, a subtest which requires a verbal response but on which no group was initially deficit (Table 17). On this first function the Ameliorative group was highest, followed closely by the Direct Verbal group. The Traditional group fell below these two but considerably above the Montessori and Community-Integrated groups.

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[6] A gain or loss in excess of 4.6 months was chosen as a descriptive evaluation point since in half of the instances mean language age difference scores for the five groups were altered to that extent.

The second function seems to clarify the differentiation between the Direct Verbal and Ameliorative groups. This function was weighted positively on Auditory-Vocal Association and Auditory Decoding where the Direct Verbal group did well and negatively on Auditory-Vocal Automatic and Visual-Motor Association where the Ameliorative group did well (Table 17, Figure 5). Pattern drill with emphasis on polar and negative structures accounts for the good performance of the Direct Verbal group on the Auditory-Vocal Association and Auditory Decoding subtests which require the child to operate within those structures. As previously noted, the score of the Ameliorative group on the Visual-Motor Association subtest was only a reflection of its atypically high initial performance, and program content cannot be credited with this good performance. On the Auditory-Vocal Automatic subtest, where the performances of the Ameliorative and Direct Verbal groups were sharply differentiated, the substantial initial deficit of the Ameliorative group was eliminated and that of the Direct Verbal group remained. Certainly both structured programs were designed to elicit the maximum number of verbal responses from each child, but apparently verbal responses made in conjunction with meaningful, manipulative experiences were more effectively incorporated into the child's verbal repertoire.

Vocabulary Comprehension

There were no significant differences among the five groups in vocabulary comprehension as measured by the Peabody Picture Vocabulary Test (Table 18). The Peabody IQ gains of the Direct Verbal, Community-Integrated, and Montessori groups were negligible. The Ameliorative and Traditional groups made the largest gains (11 and 13 points respectively) and were equally effective in promoting vocabulary comprehension at the auditory-visual level assessed by this instrument. The verbal expressive strengths demonstrated in varying degrees by three (Ameliorative, Direct Verbal, and Traditional) of the five groups on the ITPA were not assessed here and may to some extent account for the nondifferential performance on the Peabody.

Visual Perception

Test-one data were obtained on the Frostig Developmental Test of Visual Perception only during the first year of the study and,

Table 17

Discriminant Analysis
ITPA Subtests
Five Groups for One Year

Variable	Raw coefficient 1	Raw coefficient 2
Auditory-Vocal Automatic	- .041558	- .057375
Visual Decoding	.008611	- .009894
Motor Encoding	.021508	- .024422
Auditory-Vocal Association	- .026458	.088463
Visual-Motor Sequencing	.027551	- .021026
Vocal Encoding	- .053344	.004059
Auditory-Vocal Sequencing	- .056481	.005092
Visual-Motor Association	- .003604	- .037076
Auditory-Decoding	.002410	.024264
Percent of Canonical Variation	48.02	29.66

Bartlett's Chi Square Test for Significance of Successive Canonical Variates

For roots 1-4 Chi Square = 99.66 with 36 df P less than .0001
For roots 2-4 Chi Square = 55.14 with 24 df P less than .0003

Discriminant Functions

	1	2
Traditional	-11.716	- 2.875
Community-Integrated	-10.210	- 3.075
Montessori	-10.072	- 2.245
Ameliorative	-12.274	- 3.188
Direct Verbal	-12.095	- 1.719

FIGURE 5

DISCRIMINANT FUNCTIONS FOR THE ITPA SUBTESTS
FIVE GROUPS FOR ONE YEAR

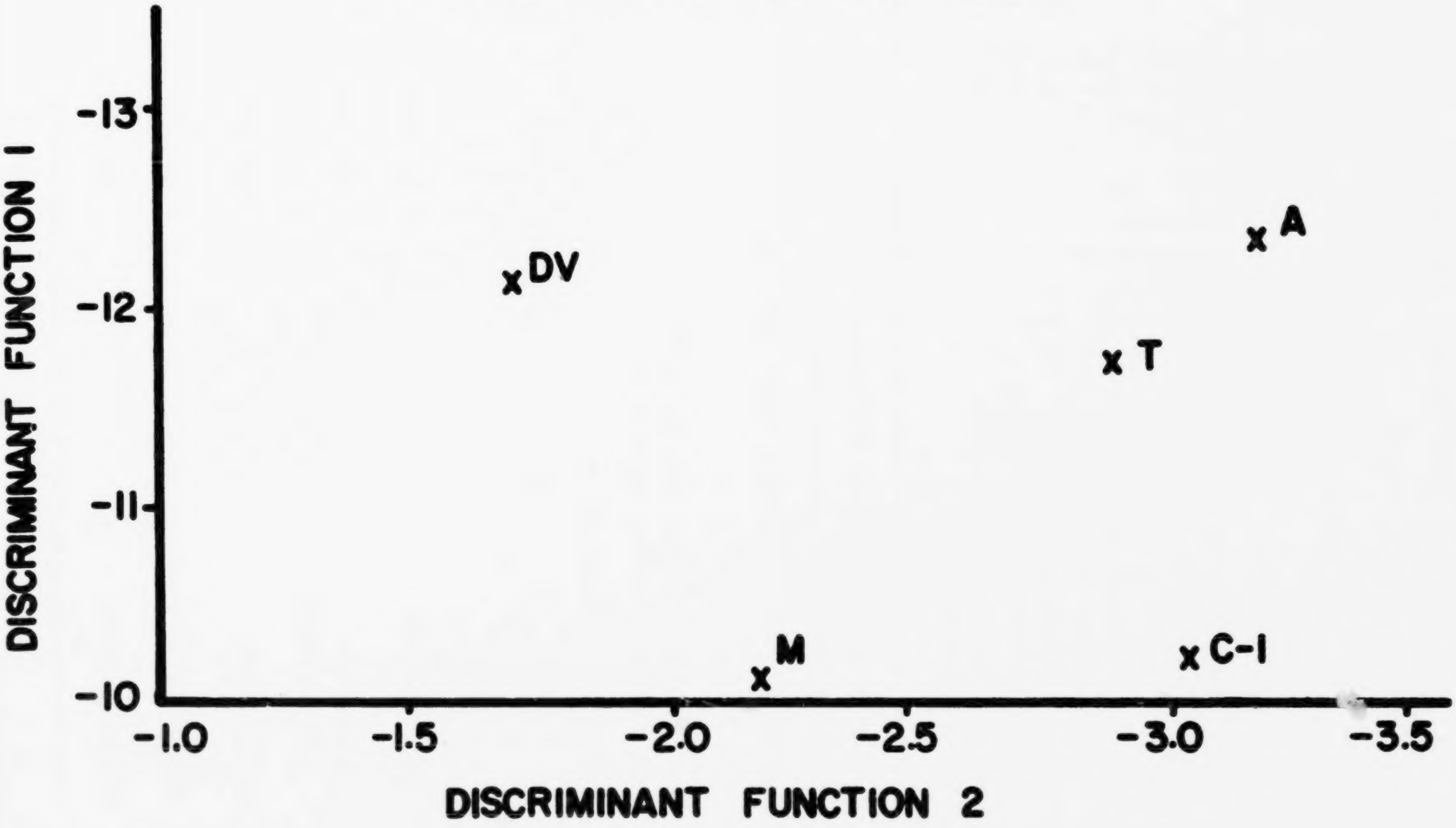

Table 18

Peabody Mean IQ
Five Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	79.8	12.7	92.5	29.88
Community-Integrated	16	81.4	4.2	85.6	22.44
Montessori	13	84.7	1.5	86.2	21.02
Ameliorative	24	85.0	10.9	95.9	30.41
Direct Verbal	23	82.7	5.7	88.4	24.26

NOTE: Initial Binet IQ, Peabody IQ, and ITPA total language age difference score (in months) were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	M 21.02	C-I 22.44	DV 24.26	T 29.88	A 30.41
		Differences			
M		1.42	3.24	8.86	9.39
C-I			1.82	7.44	7.97
DV				5.62	6.15
T					.53
Table Value		2.81	3.38	3.71	3.94
Corrected Table Value		7.58	9.12	10.01	10.52

$\sqrt{MS_{\text{within/harmonic mean}}} = 2.699$

*Significant difference at .05 level

Summary: Although the univariate F was significant, there were no significant differences among groups.

consequently, are not available for the Montessori and Community-Integrated groups or the Direct Verbal class unit of the second year. Frostig (1964) suggests that children scoring in the lowest quartile (a perceptual quotient of 90 or below) will experience difficulty in school adjustment and recommends remedial training for these children. The test-one scores of 96% of the children in the Traditional program, 75% of the children in the Ameliorative program, and 91% of the children in the first year's Direct Verbal class unit fell in the lowest quartile. It is reasonable to assume that the Montessori and Community-Integrated groups and the second Direct Verbal class unit would have included similar percentages of children in this low range.[7] To the extent that visual perceptual inadequacies are related to subsequent school difficulty, these initial performances were disconcerting.

The Frostig was given to all groups at the time of the second test battery. The performance of the Ameliorative group was significantly higher than that of the other four groups (Table 19). Only 21% of the children in the Ameliorative group now scored in the lowest quartile. In the Direct Verbal group 43% scored in the lowest quartile while 76 to 81% of the children in the other three groups obtained such scores.

The visual-motor activities included in the Traditional and Community-Integrated programs were relatively unstructured and global in nature (playground activities, art projects, puzzles), and most of the children in these two programs scored in the lowest quartile. The children in the Montessori group did not do well on this test in spite of the emphasis given to rather precise motor-sensory activity (templates, form boxes, kinesthetic alphabet, sensory materials related to shape, weight, and size). Although the Direct Verbal program emphasized an oral mode of instruction, elements in the reading and mathematics curricula (particularly the writing of letters and numerals) involved visual-motor participation and seemed to have been effective in promoting growth in this area. All three curricula in the Ameliorative program included learning activities designed to contribute to the development of visual perceptual skills: the unit on geometric shapes in the mathematics curriculum, a sequence of cutting lessons, dot-to-dot exercises in a large, uncluttered format, matching exercises, pasting exercises which emphasized figure-ground, and pencil/crayon work in general. Frostig remedial materials were used during the last six weeks of the program. The performance of the Ameliorative group indicates the dramatic progress which may be made in visual perceptual development by disadvantaged children.

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[7] The percentages of children initially scoring in the lowest quartile in four subsequent research class units established according to the procedures outlined in this report ranged from 81 to 88 and were consistent with the scores of the Traditional, Ameliorative, and Direct Verbal groups.

Table 19

Frostig Mean PQ
Five Groups at the End of One Year

Group	N	Test 2	Covaried Mean
Traditional	25	84.9	25.56
Community-Integrated	16	80.4	21.54
Montessori	13	79.8	19.86
Ameliorative	24	99.6	38.96
Direct Verbal	23	90.3	30.44

NOTE: Initial Binet IQ, Peabody IQ, and ITPA total language age difference score (in months) were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	M	C-I	T	DV	A
	19.86	21.54	25.56	30.44	38.96
		Differences			
M		1.68	5.70	10.58*	19.10*
C-I			4.02	8.90*	17.42*
T				4.88	13.40*
DV					8.52*
Table Value		2.81	3.38	3.71	3.94
Corrected Table Value		7.29	8.77	9.62	10.22

$\sqrt{MS_{\text{within}}/\text{harmonic mean}} = 2.594$

*Significant difference at .05 level

Summary:

1. The Ameliorative group was significantly higher than the other four groups.
2. The Direct Verbal group was significantly higher than the Community-Integrated and Montessori groups but not significantly higher than the Traditional group.
3. The Traditional, Community-Integrated, and Montessori groups were not significantly different from each other.

School Readiness

The Metropolitan Readiness Tests were given to the five groups at the time of the second test battery. There were no significant differences among groups on the Reading Readiness Test (Table 20). The Ameliorative and Direct Verbal groups scored significantly higher on the Number Readiness Test than did the Traditional and Montessori groups (Table 21). The superior performance of the two structured groups reflects their highly specific mathematics curricula and suggests the effectiveness of these programs in preparing children for more formal mathematics. The predictive value of this instrument is limited when administered to children at this age, and the data obtained at the end of the second year of the study provide a more appropriate base for discussion.

Summary of Results at the End of the Preschool Year

The children in the two highly structured programs (Ameliorative and Direct Verbal) showed substantial gains in intellectual functioning (Binet IQ) with remarkable consistency. No child in either program failed to make an IQ gain. On test two 92% of the children in the Ameliorative group and 74% of the children in the Direct Verbal group fell in the high intelligence strata. The children in the other three groups made more modest gains and from 15 to 24% of these children regressed.

On the initial assessment of language development (ITPA) the children in this study were most deficit in verbal expressive abilities. The major initial deficit of the Ameliorative group was eliminated on each of the three subtests related to this area. The Direct Verbal group eliminated its major deficit on two of these three subtests. The Traditional group did relatively well in this area. The performances of the Community-Integrated and Montessori groups on these three subtests were static at best, and their substantial deficits remained at the time of test two.

The magnitude of the gains of the Ameliorative group on the nine subtests of the ITPA and the consistency with which it made these gains resulted in an essentially nondeficit test-two performance. The Traditional group made consistent but more modest gains and had no major deficits (deficits in excess of 6 months) at the time of test two. The Direct Verbal group made somewhat larger gains than the Traditional group but made these gains somewhat less consistently and had major deficits on two subtests at test two. The Community-Integrated and Montessori groups generally made smaller and less consistent gains than the other three groups. The movement of the Montessori group was somewhat regressive while that of the Community-Integrated group was more nearly static.

There were no significant differences among the five groups in vocabulary comprehension as measured by the Peabody Picture

Table 20

Metropolitan Reading Readiness Mean Raw Score
Five Groups at the End of One Year

Group	N	Test 2	Covaried Mean
Traditional	25	36.6	-12.97
Community-Integrated	16	38.1	-11.36
Montessori	13	40.8	- 9.97
Ameliorative	24	40.6	-10.47
Direct Verbal	23	37.1	-13.19

NOTE: Initial Binet IQ, Peabody IQ, and ITPA total language age difference score (in months) were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

Table 21

Metropolitan Number Readiness Mean Raw Score
Five Groups at the End of One Year

Group	N	Test 2	Covaried Mean
Traditional	25	5.9	-19.22
Community-Integrated	16	7.4	-17.61
Montessori	13	5.3	-20.25
Ameliorative	24	10.8	-15.02
Direct Verbal	23	10.3	-15.14

NOTE: Initial Binet IQ, Peabody IQ, and ITPA total language age difference score (in months) were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	M -20.25	T -19.22	C-I -17.61	DV -15.14	A -15.02
		Differences			
M		1.03	2.64	5.11*	5.23*
T			1.61	4.08*	4.20*
C-I				2.47	2.59
DV					.12
Table Value		2.81	3.38	3.71	3.94
Corrected Table Value		2.32	2.79	3.06	3.25

$\sqrt{MS_{\text{within/harmonic mean}}} = .826$

*Significant difference at .05 level

Summary:

1. The Ameliorative and Direct Verbal groups, which did not differ significantly from each other, were significantly higher than the Montessori and Traditional groups but not significantly higher than the Community-Integrated group.
2. The Community-Integrated, Montessori, and Traditional groups did not differ significantly from each other.

Vocabulary Test. The performance of the Ameliorative group in visual perception (Frostig) was significantly higher than those of the other four groups. On test two, over 75% of the children in the Traditional, Montessori, and Community-Integrated groups earned scores indicating a need for remediation; in the Direct Verbal group 43% of the children earned such scores. Only 21% of the children in the Ameliorative group scored at this low level. An assessment of school readiness (Metropolitan) indicated the statistical superiority of the Ameliorative and Direct Verbal groups in number readiness only.

CONCLUSIONS AT THE END OF THE PRESCHOOL YEAR

Since the five intervention programs were chosen to represent points along a continuum of structure, one might assume that the results would order themselves along this continuum to the extent that structure is a valid dimension in effecting change. A reasonable assumption might have been that the effects of the two traditionally-oriented programs would be similar, with particular advantage falling to the Community-Integrated group in the area of language development. The results of the highly structured Ameliorative and Direct Verbal programs would place them at the opposite end of the continuum. Finally, the Montessori group would fall somewhere between these two positions, perhaps somewhat closer to the structured groups than to the traditional groups. Such was not the case. The children in the Ameliorative and Direct Verbal programs (high on the structure continuum) generally showed the greatest gains. Those who participated in the Traditional program (low on the structure continuum) showed more modest gains. Children in the Community-Integrated program (also low on the structure continuum) and those who participated in the Montessori program (midway on the structure continuum) showed the least progress.

The failure of the Montessori children to demonstrate appreciable progress seems to invalidate the notion that the level of structure relates to the progress made by the disadvantaged child. The paradox here may be more apparent than real. The Montessori program provided a high degree of structure in terms of careful planning for the kinds of motor-sensory activity appropriate to the development of an adequate base from which language and cognitive skills arise. Such provisions in terms of teacher planning and available materials may be considered comparable to the activities used to elicit verbal responses (the game format) in the Ameliorative program or the pattern drill and sequential learning tasks offered in the Direct Verbal program. The resolution of the paradox may lie in the provisions for verbal interactions in the three programs. In the Ameliorative and Direct Verbal programs children were systematically engaged in verbal interactions with the teacher. In contrast, the absence of such interactions, either as verbal drill or concomitant with performance, characterized the

Montessori classroom. The teacher provided a "prepared environment"; she did not, however, systematically engage the child in verbalizations or require such verbalizations as part of the definition of productive involvement. This failure of the Montessori program resulted, at least during the intervention interval, in somewhat regressive language behavior. Placing disadvantaged children in a setting which does not demand that they use the verbal symbols they have and which rewards behavior which does not require the acquisition of new verbal skills resulted in the poorest language performance of the five intervention groups. Structured emphasis on motor-sensory development without similar concern for verbal development programmatically moves in the wrong direction for the disadvantaged child.

Finally, arbitrary elements in the research design of this study may have inhibited the effectiveness of the Montessori program more than the other four interventions. First, the age criterion used in this study did not coincide with the optimum and earlier age for intervention advocated by Montessori. Second, a program interval of such short duration is inconsistent with the relatively long-term Montessori developmental theory. Third, proponents of Montessori theory might well feel that the establishment of an adequate motor-sensory base, even during so truncated an interval and at so relatively late an age, will enhance language and cognitive development at a time beyond the scope of this report. Follow-up studies of these children may support such a point of view.

The expectation that children in the Community-Integrated group would show progress equal to or greater than that of the children in the Traditional group was not substantiated. The integration of small numbers (N = 2 to 4) of disadvantaged children into classes of middle- and upper-class children was intended to alter certain aspects of the learning situation. Central to the altered classroom dynamics was the presence of an advantaged-peer language model in addition to the teacher model provided in all programs. Theoretically, spontaneous verbal interactions in both traditional programs represented critical opportunities for language development and were weighted in favor of the Community-Integrated participants.

The disadvantaged children in the Community-Integrated program, however, failed to incorporate the language model of their advantaged peers because they did not reciprocate in verbal interactions at any significant level. They not only failed to interact verbally in peer-initiated play but tended to withdraw from quasi-structured, teacher-directed activities and thus sharply limited the progress they were to make. The homogeneity of the Traditional group, on the other hand, required these children to respond verbally during such activities. Their teachers necessarily accommodated these activities to the verbal level of the children and gradually developed more acceptable and extended responses. The progress in verbal expressive ability made by the children in the Traditional program reflects this accommodation.

The failure of socioeconomic integration in this instance cannot be viewed as evidence that disadvantaged children do not derive benefits from integration with their advantaged peers. The ratio of socioeconomic integration used in this study failed to accelerate the language development of the disadvantaged children, and it is altogether possible that this ratio mitigated against change. A more nearly equitable ratio between the two socioeconomic groups might have created a setting in which the disadvantaged children participated more freely and were involved in verbal interactions more frequently. Then, too, it is possible that the impact of a peer language model cannot be felt during so short an interval. Finally, four may not be the most appropriate age for deriving maximum benefits from a peer language model.

The very real progress made by the children in the Traditional program must be viewed against the generally superior performance of the children in the two highly structured programs. The effectiveness of directly teaching specific content was illustrated by the superior performance of the Ameliorative and Direct Verbal groups on the number readiness test of the Metropolitan. The magnitude and consistency of their gains in intellectual functioning (Binet IQ) clearly endorse the importance of providing a setting in which the child is required to make appropriate and increasingly complex verbalizations. There is some evidence that obtaining these verbalizations in conjunction with productive, manipulative experiences (Ameliorative program) more effectively developed visual perceptual skills (Frostig) as well as the visual-motor skills involved in certain ITPA subtests (Visual Decoding, Visual-Motor Sequencing, and Motor Encoding). In addition, children who made verbal responses concurrent with meaningful, manipulative experiences more effectively incorporated syntactical constructs into their verbal repertoire (Auditory-Vocal Automatic subtest). On the other hand, verbal pattern drills (Direct Verbal program) provided unique opportunities to develop the auditory reception of structured aspects of language (Auditory-Vocal Association and Auditory Decoding subtests).

THE SECOND YEAR OF THE STUDY

Interventions during the Kindergarten Year

During their second year in the study the children in the Traditional, Community-Integrated, Montessori, and Ameliorative programs attended public kindergarten for a half day. No research intervention was made in the public kindergarten. The children in the Ameliorative program, with parental permission and through arrangement with public school administrators, attended public kindergarten in the morning and, in addition, participated in a one-hour supportive program at the research center in the afternoon. According to the research design, children in the Direct Verbal program were not to attend public kindergarten and were to return to the research center for a half-day program. At parental insistence or teacher suggestion, however, five of the twenty-three children attended public school kindergarten in the morning and the Direct Verbal program in the afternoon.

To facilitate bussing, the children in the Ameliorative supportive program were divided on the basis of residential area into two classes of twelve children each. One class attended the supportive program from 1:00 to 2:00 p.m.; the other, from 2:15 to 3:15. Each of these classes was further divided into two learning groups on the basis of individual performance on battery-two tests and recommendation of the preschool teachers from the previous year. In general, the high group (N = 6) in both the one and two o'clock classes was considered ready for pre-reading activities and competent in the number concepts taught the previous year, including rational counting to ten. They were judged capable of following routine directions and able to work independently for relatively sustained periods. The children in the low group (N = 6) in each class were considered less ready for both reading and math materials in any formal sense and less able to work independently in a sustained and orderly fashion. Two elementary school teachers were in charge of the supportive program; one taught the high group in each class and the other taught the low group.

The one-hour supportive session was divided into two periods--language development/reading readiness and mathematics concepts. This schedule was broken for an occasional field trip or art project, but art, music, and indoor-outdoor play generally were not scheduled. An effort was made to avoid repeating activities which had already been provided in the morning public kindergarten and to emphasize activities directly related to first-grade academic success. During the reading readiness/language period, teachers continued to use multiple copies of inexpensive books in a storytime similar to that of the previous year's Ameliorative preschool program. Related activities stressed specific vocabulary, sequential and causal relationships, and immediate and long-term recall. The letters of the alphabet were taught by name, and all children mastered the printing of their names and of a good portion of the alphabet. Initial consonant sounds and rhyming words were stressed. Selected materials from the Frostig Program for the Development of Visual Perception were used as were portions of standard phonics workbooks and experience charts. All children mastered some sight words, and the children in the high group were reading at a pre-primer level in the spring; however, an intensive reading program was not begun with either group.

During the math period manipulative materials were used in a manner similar to that employed in the Ameliorative preschool to present equivalent and non-equivalent sets and global terms such as more, less, and same as. The visual recognition of numerals and their printed names and the writing of the numerals were taught. Combinations through five in addition and subtraction were mastered by all children using manipulative materials; most of the children in the high group and some of the children in the low group were able to handle these combinations without concrete aids and to perform the operations at the blackboard or with pencil and paper.

Because the test-two performance of the Ameliorative group on all ITPA subtests had been essentially nondeficit, the major orientation of the supportive program was toward school readiness rather than language development. Since these children had demonstrated competence in visual perceptual skills (Frostig) and a mean Binet IQ substantially above 100 (only two children scored below 100) and because they were approaching an age appropriate to more specific academic endeavors, this shift in program emphasis seemed reasonable.

The Direct Verbal program in the second year of the study offered an extension of the first year's curriculum. The children were grouped by ability for twenty-five minute instructional periods in reading, arithmetic, and language. The opening activity for the afternoon was writing practice which consisted of a series of programmed writing sheets developed in conjunction with the arithmetic and reading curricula. The first instructional period was followed by a break for juice and toileting; the second, by a period of art and stories; and the third, by music and games.

The language program included concepts of measure (time, distance, temperature), the formal use of many function words (same, different, if, then, or, each, only, all, some), the vocabulary engendered by a study of the part-whole relationship of over 100 objects, and the names of the major orchestral and band instruments. A series of stories was developed to acquaint children with concepts not easily demonstrated in the classroom. The language period also included science (geographical characteristics and aspects of the solar system) and social studies (forty job descriptions and their related terms).

A highly systematized reading method was developed by the Direct Verbal staff who considered disadvantaged children to lack necessary reading sub-skills. These sub-skills were carefully and sequentially taught and included blending, rhyming, visual discrimination, left-to-right orientation and sequencing. The children were taught to recognize symbols as sounds and to combine these sounds, using the sub-skills, into words.

In arithmetic the children received further work in the curriculum initiated the first year and no significant alterations were made. They continued to use numbers and symbols to work basic arithmetic problems, learned to solve story problems, and were taught algebraic problems (3 + □ = 6, □ - 1 = 2, 3 x 2 = □).

RESULTS AND DISCUSSION AT THE END OF THE KINDERGARTEN YEAR

Statistical Procedure

At the end of the second year of intervention, statistical comparisons were made between data from batteries one and three, and only inferences can be drawn between data from batteries two and three. Statistical treatment of the total battery data (Binet, ITPA total, Frostig, and Metropolitan) employed a multivariate analysis of covariance using initial Binet, ITPA total, and Peabody scores as covariates. Since initial Frostig data were not obtained for all groups and since the Metropolitan was not included in battery one, scores from these instruments were not available for use as covariates. A separate multivariate analysis of covariance of ITPA subtest data used the initial scores from the nine subtests as covariates. When multivariate F's were significant, Newman-Keuls tests at the .05 level were conducted in those instances when univariate F's were also significant.

Total Battery

The F ratio for the multivariate test of equality of mean vectors for the five instruments in the test-three battery was significant at the .0001 level (Table 22). Univariate F's indicated significant differences among the five groups on all five instruments.

Intellectual Functioning

Clearly the performance of the Direct Verbal group in intellectual functioning was superior to that of the other four groups (Table 23). Only the children in the Direct Verbal group made a substantial gain during the second year, and the other four groups remained relatively unchanged (Figure 6). The percentages of children who fell in the high intelligence strata did not alter

Table 22

Total Battery Multivariate Analysis of Covariance
Five Groups for Two Years

F ratio for multivariate test of equality
of mean vectors = 6.7274

df = 20 and 296 P less than .0001

Variable	Between Mean Square	Univariate F	P less than
Binet IQ	672.7324	8.6032	.0001
Frostig PQ	1134.1157	9.8417	.0001
Metropolitan Reading Readiness Test Raw Score	233.2256	6.7139	.0001
Metropolitan Number Readiness Test Raw Score	251.3392	18.6368	.0001
ITPA Total Language Age Difference Score*	244.9452	5.7205	.0004

NOTE: Initial Binet IQ, Peabody IQ, and ITPA total language age difference scores (in months) were used as covariates.

*To relate language age to chronological age, a difference score (in months) was computed by subtracting a child's chronological age at the time of testing from his language age.

Table 23

Stanford-Binet Mean IQ
Five Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	94.4	5.6	100.0	-28.23
Community-Integrated	16	93.3	5.9	99.2	-27.62
Montessori	13	93.4	7.4	100.8	-27.85
Ameliorative	24	96.2	12.4	108.6	-21.84
Direct Verbal	23	94.6	19.0	113.6	-15.26

NOTE: Initial Binet IQ, Peabody IQ, and ITPA total language age difference scores (in months) were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	T	M	C-I	A	DV
	-28.23	-27.85	-27.62	-21.84	-15.26

Differences

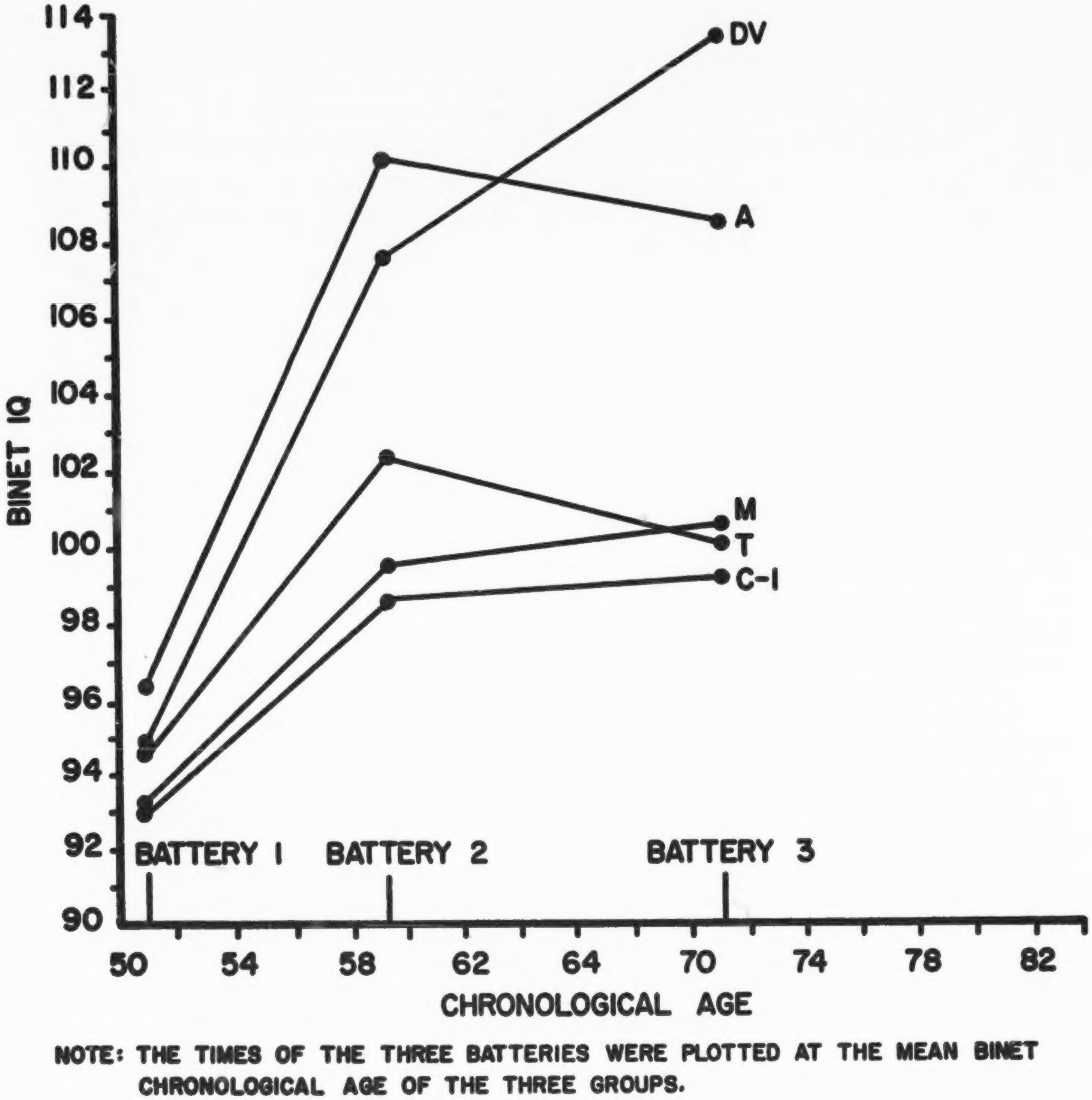
	M	C-I	A	DV
T	.38	.61	6.39	12.97*
M		.23	6.01	12.59*
C-I			5.78	12.36*
A				6.58*
Table Value	2.81	3.38	3.71	3.94
Corrected Table Value	5.72	6.88	7.55	8.01

$\sqrt{MS_{\text{within}}/\text{harmonic mean}} = 2.034$

*Significant difference at .05 level

Summary: The Direct Verbal group was significantly higher than the other four groups which did not differ significantly from each other.

FIGURE 6
STANFORD BINET IQ
FIVE GROUPS FOR TWO YEARS



NOTE: THE TIMES OF THE THREE BATTERIES WERE PLOTTED AT THE MEAN BINET CHRONOLOGICAL AGE OF THE THREE GROUPS.

radically between test two and test three (Table 24). The high strata percentage in the Traditional group remained unchanged. The relative positions of the Community-Integrated and Montessori group were reversed, with the advantaged now falling to the Community-Integrated group. The Ameliorative and Direct Verbal groups also reversed their positions, with the higher percentage now falling to the Direct Verbal group.

Table 24

High Intelligence Strata
Five Groups for Two Years

Group	Test One	Test Two	Test Three
T	28%	48%	48%
C-I	38%	31%	50%
M	23%	54%	38%
A	33%	92%	75%
DV	30%	74%	87%

An examination of the distribution of IQ gains between battery one and battery three (Table 25) reveals a pattern similar to the one found at the end of the first year (Table 4). The two structured programs (Ameliorative and Direct Verbal) had substantially fewer children who regressed and again had more children who made gains of ten or more points than the other three groups. The only material changes were a decrease (from 70% to 58%) in the number of children in theAmeliorative program who gained ten or more points and an increase (38% to 47%) in the number of children from the Montessori program who made gains of that magnitude.

The continuing IQ gain of the Direct Verbal group in the second year resulted from continuing gains by the children in the middle (an additional 10 points) and low (an additional 7 points) strata (Table 26). The children in the high stratum of the Direct Verbal group made no additional gain the second year. The gains in each of the three strata for the Community-Integrated and Traditional groups remained essentially unchanged the second year. The children in the high stratum of the Montessori group made no gain in the first year and a slight regression the second. On the other hand, the children in the low stratum of the Montessori group made a substantial gain of 12 points the first year and increased that gain to 17 points during their year in public kindergarten. These gains suggest that the Montessori program was highly effective in establishing improved intellectual functioning with children who had initially indicated limited potential. The relatively large mean gain (approximately 13 points over the two-year period) of the Ameliorative group was rather consistently achieved by each strata each year.

Table 25

Distribution of IQ Gains
by Intervention
Batteries 1-3

Gain in IQ Points	Group									
	Traditional N=25		Community-Integrated N=16		Montessori N=13		Ameliorative N=24		Direct Verbal N=23	
	%	N	%	N	%	N	%	N	%	N
40 to 44	0	0	0	0	0	0	0	0	4	1
35 to 39	0	0	0	0	0	0	4	1	0	0
30 to 34	0	0	6	1	0	0	0	0	9	2
25 to 29	0	0	0	0	0	0	4	1	17	4
20 to 24	4	1	0	0	8	1	17	4	22	5
15 to 19	16	4	6	1	31	4	12	3	17	4
10 to 14	20	5	12	2	8	1	21	5	17	4
5 to 9	20	5	31	5	15	2	25	6	9	2
0 to 4	16	4	19	3	23	3	12	3	0	0
-1 to -5	12	3	12	2	8	1	0	0	0	0
-6 to -10	4	1	12	2	0	0	4	1	4	1
-11 to -15	8	2	0	0	8	1	0	0	0	0

NOTE: IQ gains (test 1-3) by race-sex categories are found in appendix B.

Table 26

Stanford-Binet IQ Gains by Strata
Five Groups for Two Years

	Group	N	Mean Binet IQ Gain	
			Test 1-2 Diff.	Test 1-3 Diff.
High Strata	T	7	6.3	4.1
	C-I	6	3.3	4.8
	M	3	0.0	- 2.7
	A	8	9.9	10.8
	DV	7	12.9	13.0
Middle Strata	T	10	8.9	5.1
	C-I	5	4.4	8.0
	M	6	5.7	5.8
	A	9	15.7	12.0
	DV	8	10.5	20.2
Low Strata	T	8	9.0	7.4
	C-I	5	8.0	5.0
	M	4	12.5	17.2
	A	7	16.0	14.7
	DV	8	15.8	23.0

The four groups that attended public kindergarten the second year basically maintained the gains in intellectual functioning made during the first year, and losses or additional gains did not exceed 3 points. Although the supportive program for the Ameliorative group was unsuccessful in fostering further IQ gains, it may have been responsible for maintaining the relatively large gain of this group. Since the first-year gain of the Ameliorative group was considerably larger than the gains of the other three groups who attended public kindergarten, a substantial regression might have occurred had these children attended public kindergarten only.[8] The continuing gains demonstrated only by the Direct Verbal group are a clear endorsement for sustained special programming for disadvantaged children.

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[8] Further information on this topic can be found in the report which follows, "A Follow-Up of Three of the Five Preschool Interventions: Evaluations over Three Years."

Language Development

The F ratio for the multivariate test of equality of mean vectors for the nine ITPA subtests was significant at the .0099 level (Table 27). Univariate F's indicated significant differences among the five groups on four subtests (Auditory-Vocal Automatic, Auditory-Vocal Association, Visual-Motor Association, and Auditory Decoding). The subtest data will again be presented according to magnitude of initial deficit.

The three subtests in which the disadvantaged children of this study were initially most deficit reflected verbal expressive abilities and are critical to program evaluation. There were no significant differences at test three among the five groups on the Vocal Encoding test (Table 28). The Direct Verbal group showed the largest gain (10 months in excess of the test interval) between test one and test three and was at the end of the kindergarten year the only nondeficit group. Figure 7 illustrates the unique performance of this group: Only the Direct Verbal group made continued progress over the two-year period. The Community-Integrated and Montessori groups had regressed during the preschool year and regained this loss during their year in kindergarten. Their major deficit in Vocal Encoding at test three closely approximated their initial deficit. The Traditional and Ameliorative groups made good progress during the preschool year but showed a regression during the kindergarten year which did not, however, reach the level of their initial deficit.

On the Auditory-Vocal Automatic test the Direct Verbal group again showed the largest gain (12 months) between test one and test three and was at the end of the kindergarten year the only nondeficit group (Table 29). The Direct Verbal group was significantly higher than the Community-Integrated group only. The Direct Verbal group made the major portion of its progress during the second year of its program (Figure 8). The Community-Integrated group made no progress on this test in either year, and its substantial initial deficit (14 months) remained. The Montessori group, however, which had doubled its deficit during the preschool year more than regained this loss during the kindergarten year. The Traditional group made modest progress on this subtest during the preschool year but regressed to its initial level of deficit at the end of the kindergarten year. The Ameliorative group had made exceptional progress the first year (12 months above the program interval) and was the only group which scored at its chronological age at test two, but during the kindergarten year this group regressed substantially (7 months).

The Direct Verbal group was significantly higher at test three than the other four groups on the Auditory-Vocal Association test (Table 30). Although the Direct Verbal program most effectivly accelerated progress on this subtest, all programs were productive

Table 27

ITPA Subtest Multivariate Analysis of Covariance
Five Groups for Two Years

F ratio for multivariate test of equality
of mean vectors = 1.6973

df = 36 and 298   P less than .0099

Variable	Between Mean Square	Univariate F	P less than
Auditory-Vocal Automatic	552.2430	2.7736	.0320
Visual Decoding	29.6562	.1311	.9707
Motor Encoding	346.3826	1.3200	.2689
Auditory-Vocal Association	464.2582	4.5872	.0021
Visual-Motor Sequencing	194.2008	1.6933	.1589
Vocal Encoding	374.7263	1.9541	.1087
Auditory-Vocal Sequencing	208.3261	1.0602	.3812
Visual-Motor Association	1009.5236	4.6067	.0021
Auditory Decoding	1101.4144	4.8073	.0015

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

Table 28

Vocal Encoding Test
Mean Language Age Difference Score in Months
Five Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	-15.1	6.8	- 8.3	28.63
Community-Integrated	16	- 8.2	1.6	- 6.6	32.31
Montessori	13	-12.6	.9	-11.7	25.21
Ameliorative	24	-14.7	4.0	-10.7	26.61
Direct Verbal	23	-11.3	9.9	- 1.4	36.57

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

FIGURE 7
VOCAL ENCODING DIFFERENCE SCORE MEANS
FIVE GROUPS FOR TWO YEARS

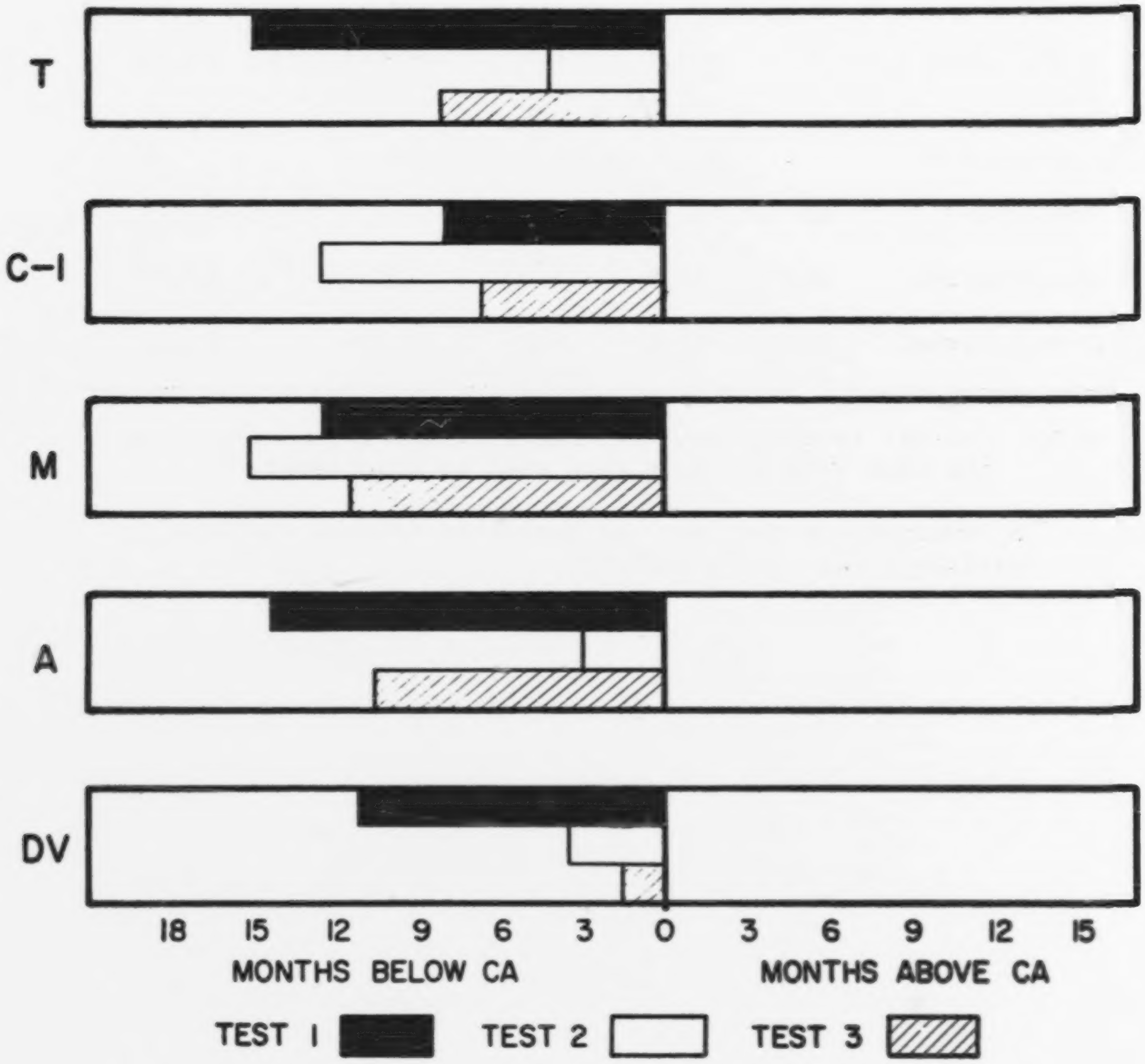


Table 29

Auditory-Vocal Automatic Test
Mean Language Age Difference Score in Months
Five Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	- 8.4	- .8	- 9.2	-50.38
Community-Integrated	16	-14.1	- .6	-14.7	-56.16
Montessori	13	- 9.6	2.0	- 7.6	-50.66
Ameliorative	24	-12.1	5.5	- 6.6	-47.83
Direct Verbal	23	-11.7	12.2	.5	-41.28

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	C-I	M	T	A	DV
	- 56.16	-50.66	-50.38	-47.83	-41.28

Differences

C-I	5.50	5.78	8.33	14.88*
M		.28	2.83	9.38
T			2.55	9.10
A				6.55
Table Value	2.81	3.38	3.71	3.94
Corrected Table Value	9.12	10.97	12.04	12.79

$\sqrt{MS_{\text{within}}/\text{harmonic mean}} = 3.246$

*Significant difference at .05 level

Summary: The Direct Verbal was significantly higher than the Community-Integrated group only.

FIGURE 8

AUDITORY-VOCAL AUTOMATIC DIFFERENCE SCORE MEANS
FIVE GROUPS FOR TWO YEARS

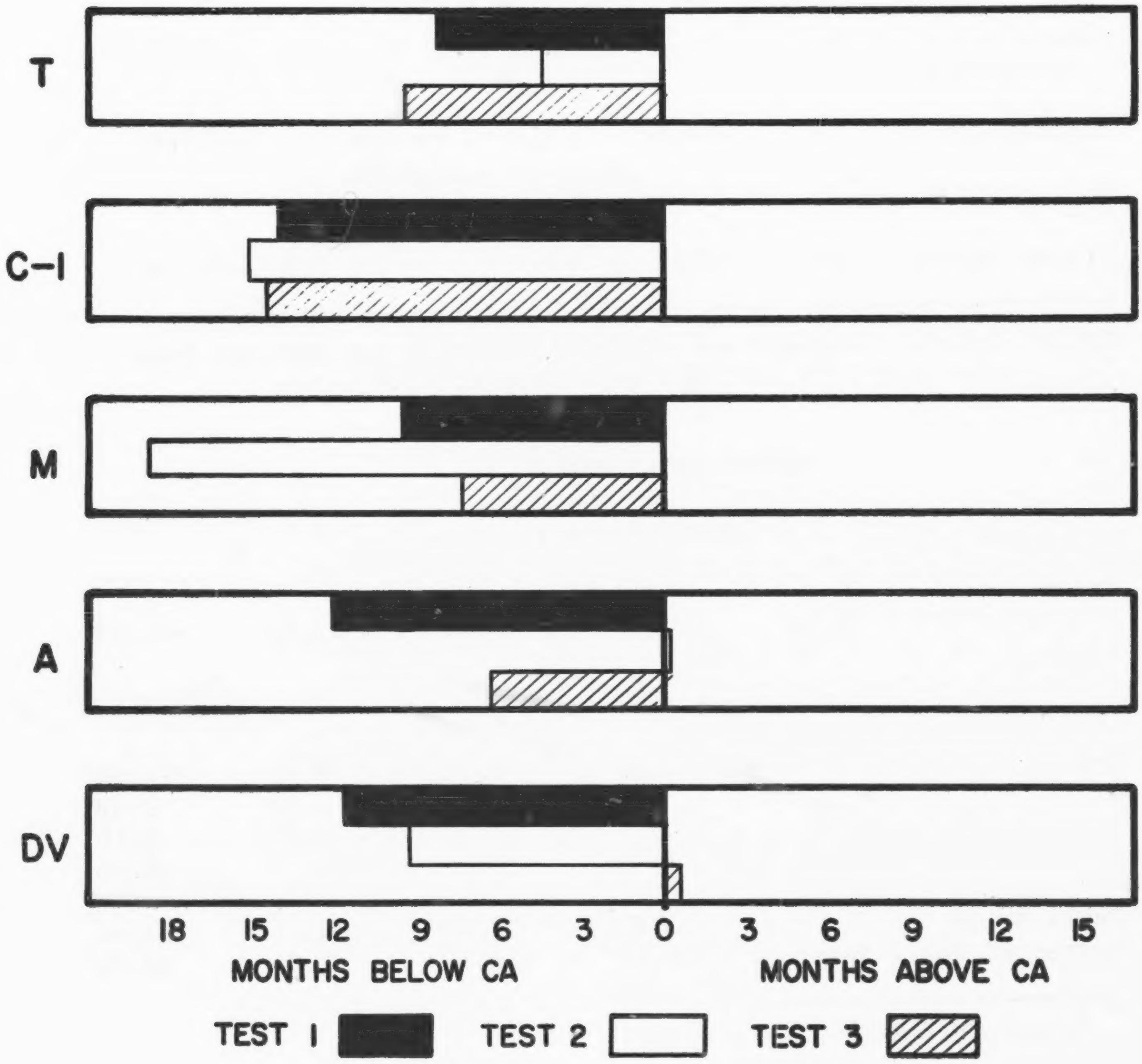


Table 30

Auditory-Vocal Association Test
Mean Language Age Difference Score in Months
Five Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	- 6.1	4.5	- 1.6	- .22
Community-Integrated	16	-11.1	4.9	- 6.2	- .12
Montessori	13	- 8.4	4.8	- 3.6	- .20
Ameliorative	24	- 5.9	8.5	2.6	2.06
Direct Verbal	23	- 9.8	16.8	7.0	10.81

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	T	M	C-I	A	DV
	- .22	- .20	- .12	2.06	10.81
			Differences		
T		.02	.10	2.28	11.03*
M			.08	2.26	11.01*
C-I				2.18	10.92*
A					8.75*
Table Value		2.81	3.38	3.71	3.94
Corrected Table Value		6.50	7.82	8.58	9.12

$\sqrt{MS_{\text{within/harmonic mean}}} = 2.314$

*Significant difference at .05 level

Summary: The Direct Verbal group was significantly higher than the other four groups which did not differ significantly from each other.

over the two-year period (Figure 9). This was the only subtest on which all groups made continued progress over the two-year period.

Of the three groups who attended only public kindergarten the second year, the Community-Integrated group demonstrated the least change on the three subtests related to verbal expressive abilities. The Traditional group, although it had shown relatively good progress on these three subtests during the preschool year, tended to regress during the kindergarten year. The Montessori group, on the other hand, which had demonstrated a regressive pattern the first year, made substantial gains during the kindergarten year. It may be that the focus of the Montessori program on sensory-motor involvement as the basic mode in which conceptual and linguistic abilities develop provided an appropriate base for subsequent language development in the kindergarten setting. Only the continuing progress of the children in this group can support this position, however, since their test-three deficits in this area approximate their initial deficits.

The regressive performance during the second year of the fourth group who attended public kindergarten (Ameliorative) is particularly distressing since these children also attended the one-hour supportive program. The nondeficit level of performance demonstrated by the Ameliorative group at the end of the preschool year was not maintained, and its test-three performance is not particularly better on these three subtests than those of the three groups who attended public kindergarten only.

The Direct Verbal group was the only group that showed continued and appreciable progress over the two-year period and was at or above its chronological age on the three subtests related to verbal expressive abilities. These results, together with the results on intellectual functioning, may be an indictment of public school programming for disadvantaged children but are clearly an endorsement of continued special programming.

On three ITPA subtests the five groups tended to show relatively smaller initial deficits (3 to 6 months): Motor Encoding, Visual-Motor Sequencing, and Auditory Decoding. The univariate F's indicated significant test-three differences among the five groups on only one of these subtests, Auditory Decoding (Table 27).

There were no signficant differences among the test-three performances of the five groups on the Motor Encoding test (Table 31), and only the Direct Verbal group made progress during the second year. Although this group had made no progress (a two-month regression) on this test during the first year, it was essentially nondeficit at the end of the second year (Figure 10). The Traditional and Montessori groups experienced relatively small losses during the kindergarten year and remained nondeficit. The performance of the Community-Integrated group was more erratic.

FIGURE 9
AUDITORY - VOCAL ASSOCIATION DIFFERENCE SCORE MEANS
FIVE GROUPS FOR TWO YEARS

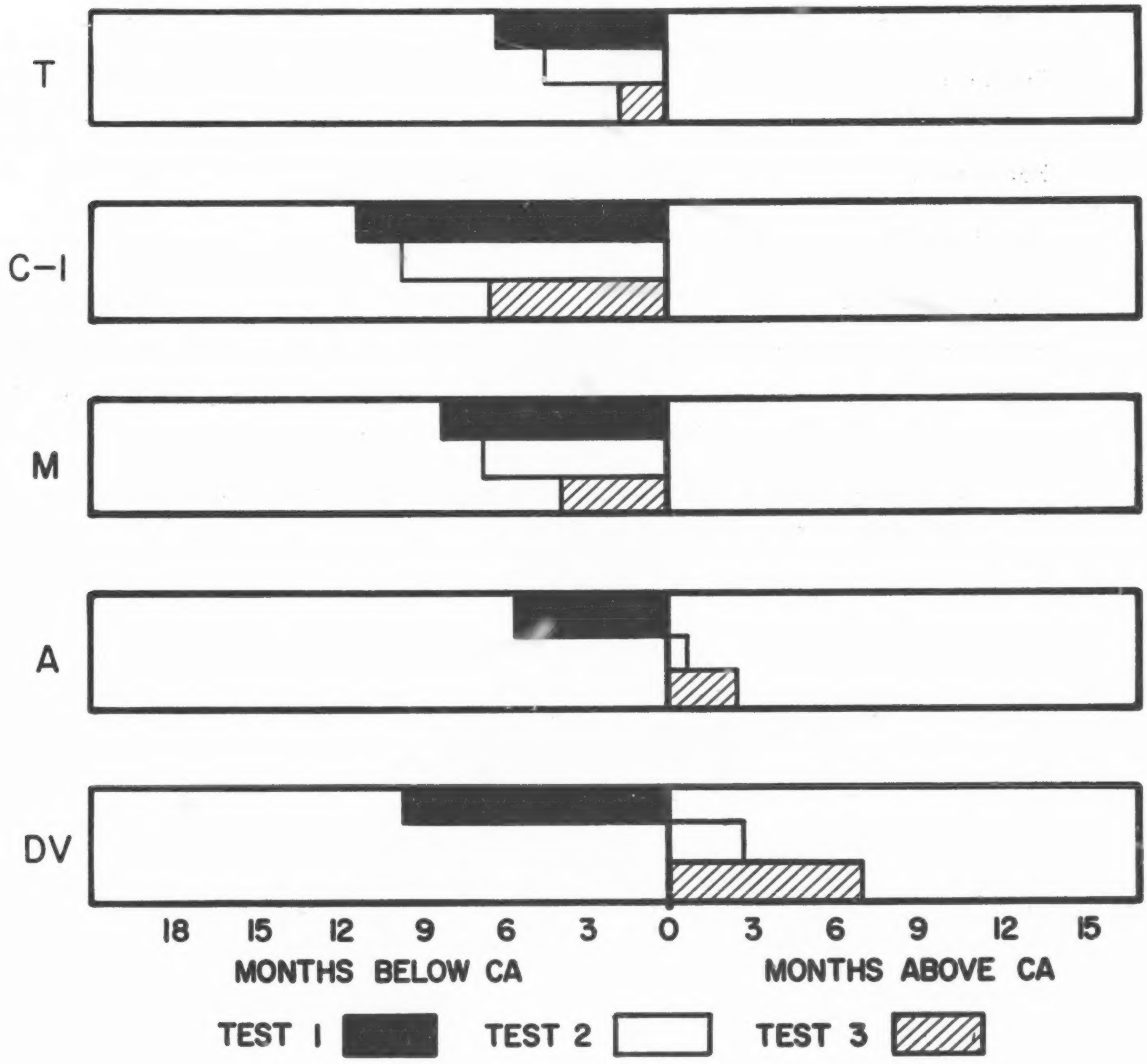


Table 31

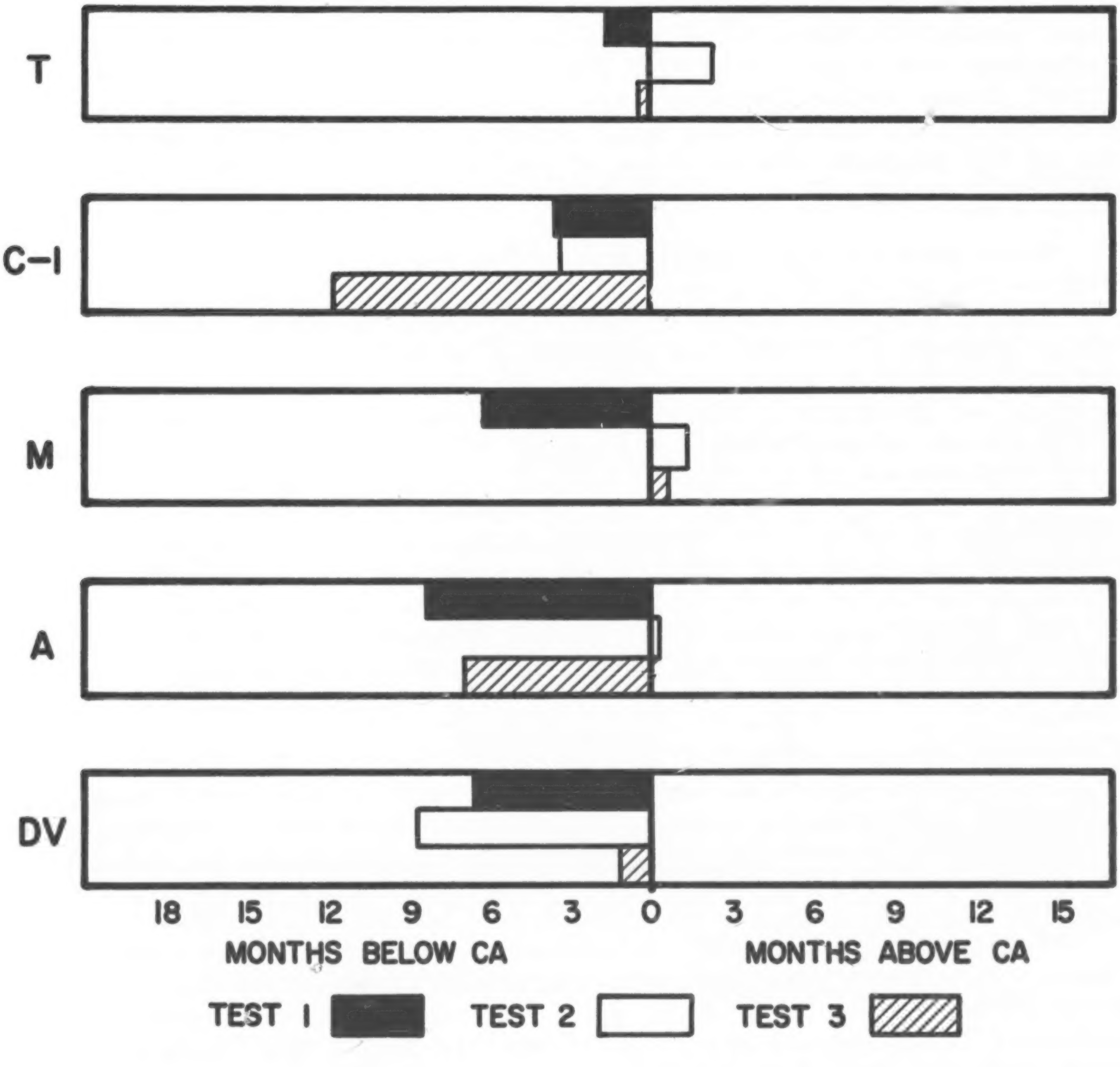
Motor Encoding Test
Mean Language Age Difference Score in Months
Five Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	-1.6	1.3	- .3	32.45
Community-Integrated	16	-3.7	-8.2	-11.9	28.65
Montessori	13	-6.1	6.7	.6	39.97
Ameliorative	24	-8.2	1.2	- 7.0	34.17
Direct Verbal	23	-6.8	5.0	- 1.8	38.85

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

FIGURE 10
MOTOR ENCODING DIFFERENCE SCORE MEANS
FIVE GROUPS FOR TWO YEARS



Initially this group had only a modest deficit (4 months) in Motor Encoding which remained at the end of the preschool intervention. At the end of the kindergarten year, however, this deficit had more than tripled. The gain (8 months) of the Ameliorative group during the preschool year was lost during the kindergarten year. Since two groups (Montessori and Traditional) essentially maintained nondeficit Motor Encoding performances during the kindergarten year and since two groups (Community-Integrated and Ameliorative) showed rather large regressions during this period and since the Direct Verbal group made progress only during the second year of its program, the relation of performance to program seems unclear.

There were no significant differences among the test-three performances of the five groups on the Visual-Motor Sequencing test (Table 32). The Direct Verbal group had a relatively small initial deficit (3 months) and achieved a nondeficit test-three performance through small gains each year (Figure 11). With the exception of Montessori, the other four groups had reached nondeficit levels of performance at the end of the first year but showed regressions of considerable magnitude (5 to 9 months) during the kindergarten year. The Montessori group demonstrated a relatively minor deficit (4 months) at both testings. Large differences among initial deficits inhibited discussion relevant to program variables at the end of the preschool year; however, the four groups began their kindergarten year with rather comparable, nondeficit performances and three groups demonstrated emerging deficits in Visual-Motor Sequencing during that year.

On the Auditory Decoding test the performance of the Direct Verbal group was significantly higher than those of the Traditional, Montessori, and Community-Integrated groups. There was no significant difference between the performances of the Direct Verbal and the Ameliorative groups (Table 33). The Direct Verbal group showed the largest gain (10 months) between test one and three and was the only group to make continued progress the second year (Figure 12). The three groups who attended only public kindergarten (Traditional, Montessori, and Community-Integrated) made relatively large regressions (5 to 14 months) during the kindergarten year and fell from a nondeficit test-two performance to a level of deficit which equaled or exceeded their initial deficit. This regression was particularly acute for the Community-Integrated group. Combined attendance at the public kindergarten and the supportive program may be responsible for the relatively stable performance of the Ameliorative group which remained nondeficit. The teacher could immediately monitor the child's auditory comprehension during small group instruction in the Direct Verbal and Ameliorative supportive programs. In a large class setting the kindergarten teacher is able to monitor individual listening habits less frequently.

Table 32

Visual-Motor Sequencing Test
Mean Language Age Difference Score in Months
Five Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	-10.8	3.3	-7.5	30.42
Community-Integrated	16	- 1.9	-6.9	-8.8	29.30
Montessori	13	.1	-4.0	-3.9	33.49
Ameliorative	24	- 7.7	1.2	-6.5	29.47
Direct Verbal	23	- 3.3	2.4	- .9	36.68

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

FIGURE 11
VISUAL-MOTOR SEQUENCING DIFFERENCE SCORE MEANS
FIVE GROUPS FOR TWO YEARS

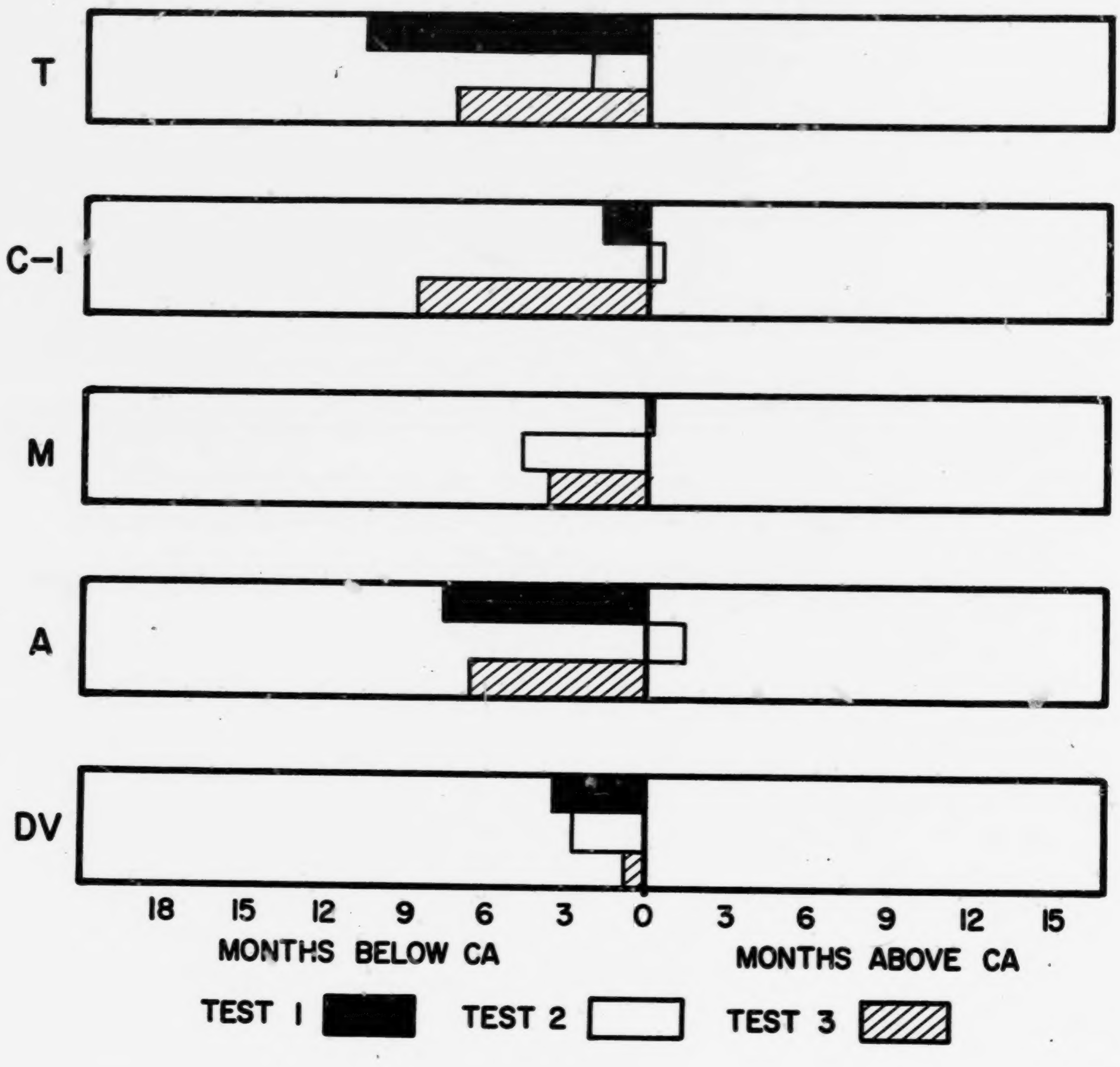


Table 33

Auditory Decoding Test
Mean Language Age Difference Score in Months
Five Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	-4.5	.9	- 3.6	29.38
Community-Integrated	16	-5.9	- 7.7	-13.6	22.65
Montessori	13	-1.0	- 5.4	- 6.4	26.30
Ameliorative	24	2.0	- 2.0	.0	33.74
Direct Verbal	23	-2.1	10.3	8.2	42.44

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	C-I	M	T	A	DV
	22.65	26.30	29.38	33.74	42.44

Differences

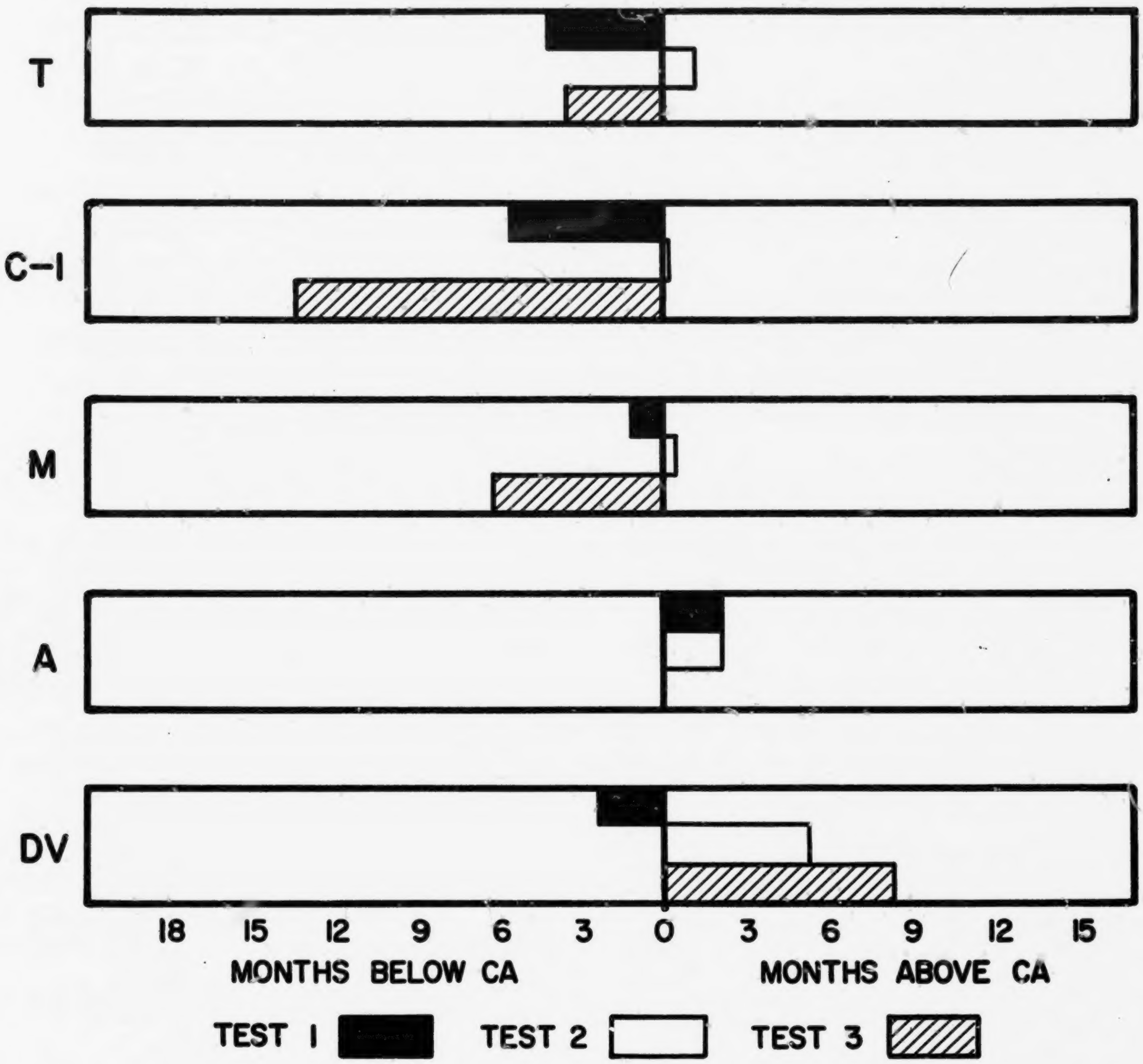
C-I	3.65	6.73	11.09	19.79*
M		3.08	7.44	16.14*
T			4.36	13.06*
A				8.70
Table Value	2.81	3.38	3.71	3.94
Corrected Table Value	9.78	11.77	12.92	13.72

$\sqrt{MS_{\text{within}}/\text{harmonic mean}} = 3.482$

*Significant difference at .05 level

Summary: The Direct Verbal group was significantly higher than the Traditional, Montessori, and Community-Integrated groups but not significantly higher than the Ameliorative group.

FIGURE 12
AUDITORY DECODING DIFFERENCE SCORE MEANS
FIVE GROUPS FOR TWO YEARS



On three ITPA subtests the five groups showed negligible or no initial deficits: Auditory-Vocal Sequencing, Visual-Motor Association, and Visual Decoding. The univariate F's indicated significant differences among the groups on only one of these subtests, Visual-Motor Association (Table 27).

There were no significant test-three differences among the five groups on the Auditory-Vocal Sequencing test (Table 34). Initially all groups were performing at their chronological age, and at test three the groups again clustered at their chronological age with the exception of the Community-Integrated group which slightly enlarged the regression made during the preschool year (Figure 13).

On test three the Ameliorative and Direct Verbal groups were significantly higher than the Traditional and Community-Integrated groups on the Visual-Motor Association test (Table 35). The high score of the Direct Verbal group again represents the largest gain between tests one and three (10 months) and continuing progress during the second year (Figure 14). The similarly high test-three score of the Ameliorative group, however, again reflects the stability of its atypically high initial score, and the small loss merely indicates that this group is approaching the ceiling of this subtest. The performance of the Traditional and Montessori groups remained relatively unaltered over the two years, although the Montessori group made a sizable gain (6 months) the second year while the Traditional group made a small regression. The performance of the Community-Integrated group was again erratic, and the seven-month gain of the first year was followed by a fourteen-month loss the second year.

There were no significant differences among the test-three performances of the five groups on the Visual Decoding test (Table 36). All groups gained the first year and lost the second year (Figure 15). The two groups (Ameliorative and Montessori) which had made the largest gains the first year experienced the most severe losses the second year, and the performances of the five groups at test three closely approximated their chronological ages, as they had at test one.

On the ITPA total the performance of the Direct Verbal group was significantly higher than those of the other four groups (Table 37). Differences between test one and three for these four groups were negligible, and only the Direct Verbal group showed a substantial gain (7 months) between tests one and three on ITPA total. The Direct Verbal group was performing two months above its chronological age on this total score while the deficits of the other groups ranged from two to nine months (Figure 16). The ITPA total, however, obscures variations in group performances, and a meaningful summary requires a restatement of subtest data.

Table 34

Auditory-Vocal Sequencing Test
Mean Language Age Difference Score in Months
Five Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	2.5	-5.4	-2.9	- 6.52
Community-Integrated	16	- .6	-8.0	-8.6	-10.58
Montessori	13	.1	-1.7	-1.6	- 5.57
Ameliorative	24	1.6	- .3	1.3	- 2.10
Direct Verbal	23	3.0	- .2	2.8	- 2.18

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

FIGURE 13
AUDITORY-VOCAL SEQUENCING DIFFERENCE SCORE MEANS
FIVE GROUPS FOR TWO YEARS

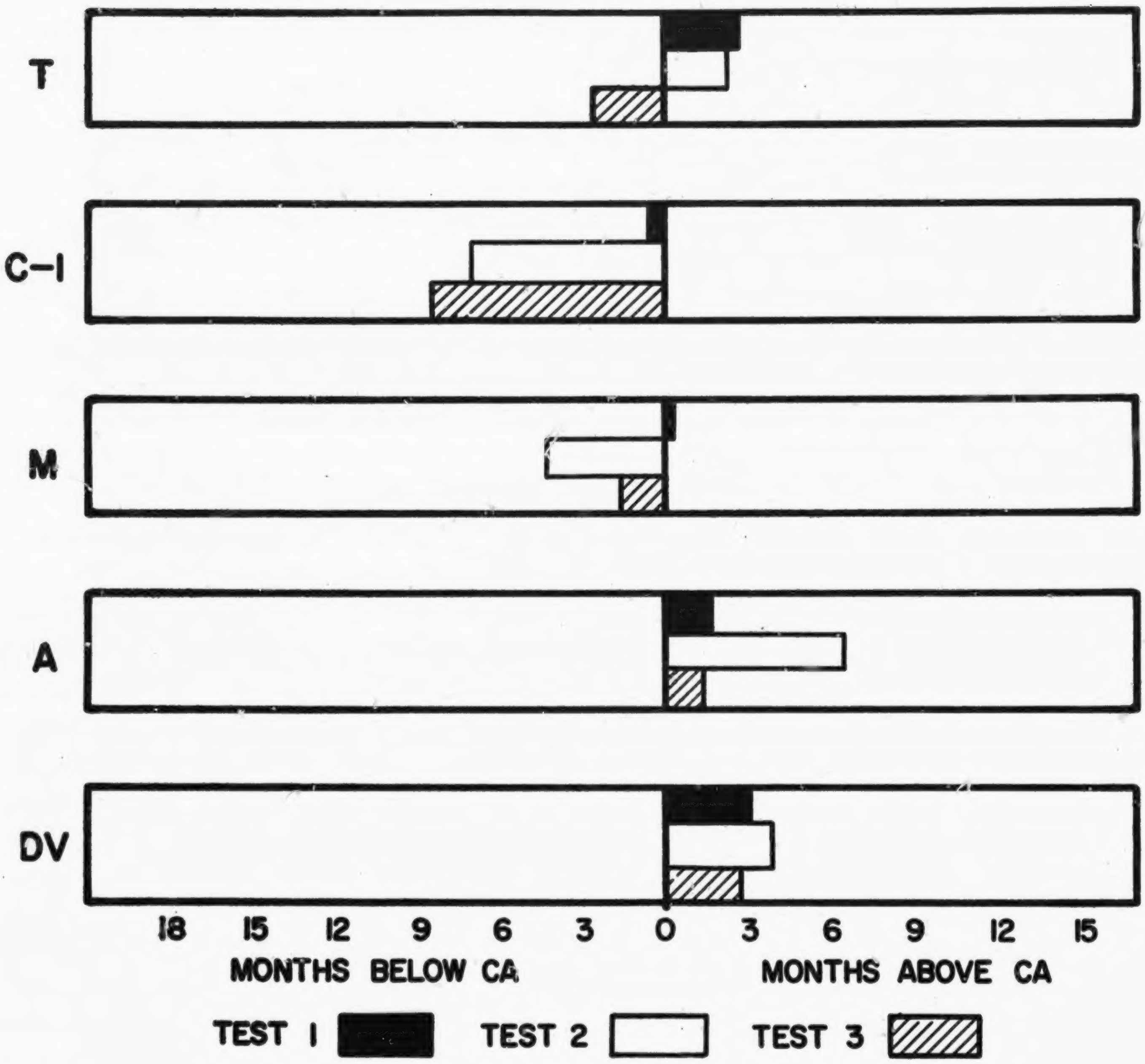


Table 35

Visual-Motor Association Test
Mean Language Age Difference Score in Months
Five Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	- 2.6	-2.2	-4.8	39.54
Community-Integrated	16	- .2	-7.2	-7.4	37.69
Montessori	13	- .8	4.1	3.3	47.23
Ameliorative	24	10.9	-1.7	9.2	53.60
Direct Verbal	23	- 1.6	9.9	8.3	53.36

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	C-I 37.69	T 39.54	M 47.23	DV 53.36	A 53.60
Differences					
C-I		1.85	9.54	15.67*	15.91*
T			7.69	13.82*	14.06*
M				6.13	6.37
DV					.24
Table Value		2.81	3.38	3.71	3.94
Corrected Table Value		9.57	11.51	12.63	13.42

$\sqrt{MS_{within}/\text{harmonic mean}} = 3.405$

*Significant difference at .05 level

Summary: The Ameliorative and Direct Verbal groups, which did not differ significantly from each other, were significantly higher than the Traditional and Community-Integrated groups but not significantly higher than the Montessori group.

FIGURE 14
VISUAL-MOTOR ASSOCIATION DIFFERENCE SCORE MEANS
FIVE GROUPS FOR TWO YEARS

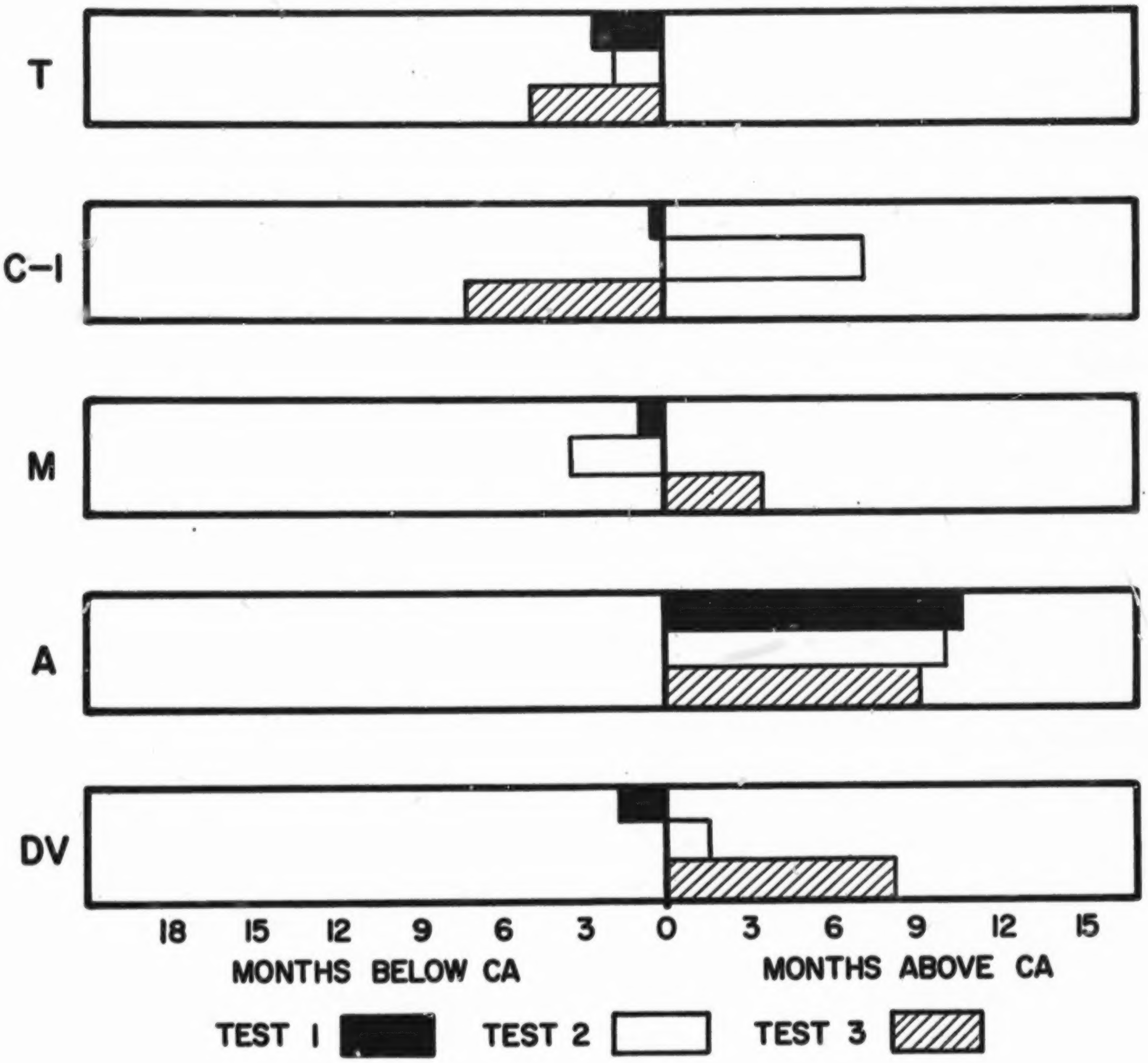


Table 36

Visual Decoding Test
Mean Language Age Difference Score in Months
Five Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	-1.3	1.2	- .1	-5.64
Community-Integrated	16	-2.8	5.2	2.4	-2.61
Montessori	13	- .4	3.0	2.6	-2.36
Ameliorative	24	- .6	2.9	2.3	-5.05
Direct Verbal	23	- .3	.9	.6	-3.78

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

FIGURE 15
VISUAL DECODING DIFFERENCE SCORE MEANS
FIVE GROUPS FOR TWO YEARS

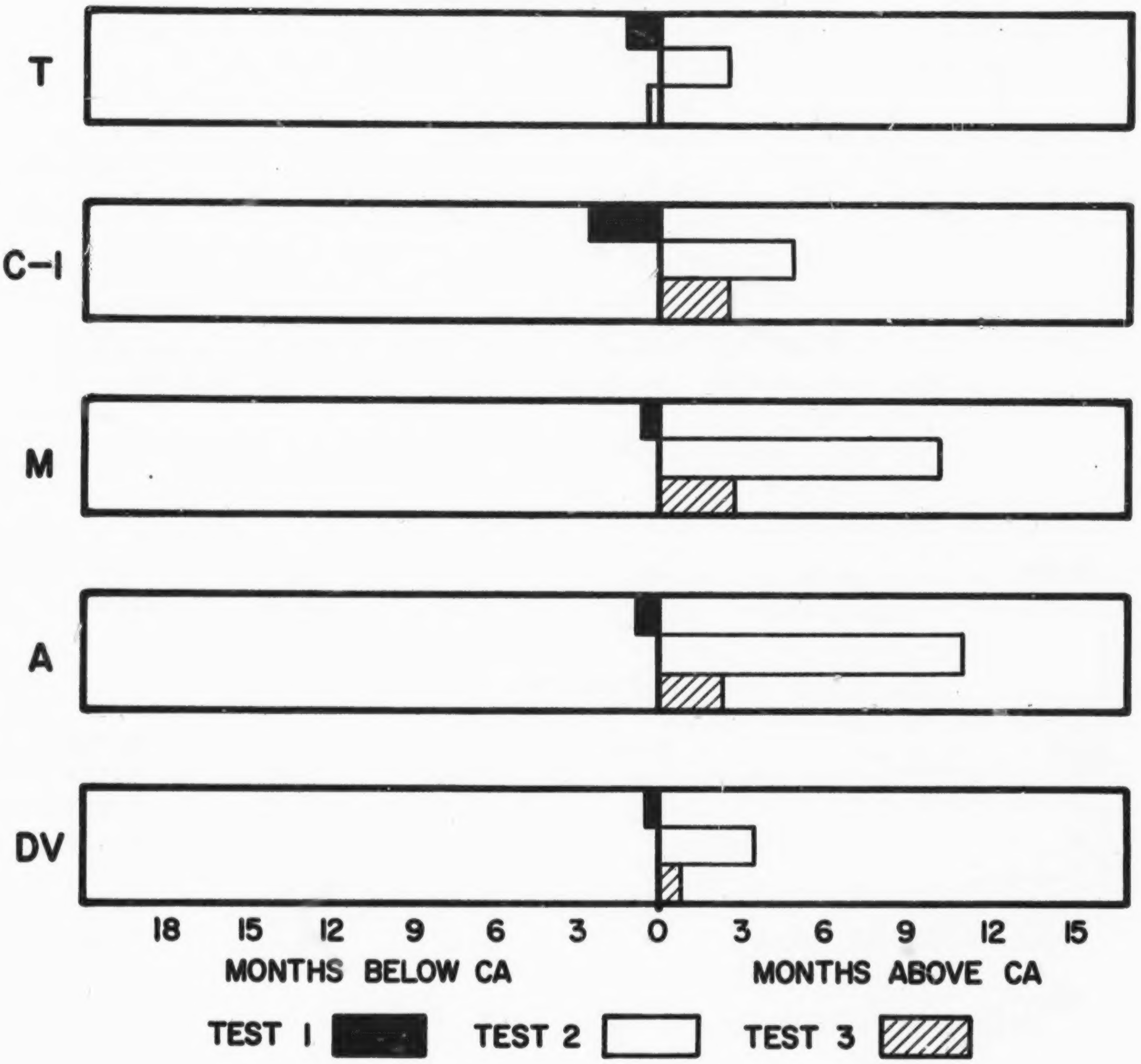


Table 37

ITPA Total
Mean Language Age Difference Score in Months
Five Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	-5.4	.7	-4.7	17.87
Community-Integrated	16	-6.3	-2.7	-9.0	14.08
Montessori	13	-4.2	- .1	-4.3	17.27
Ameliorative	24	-3.7	1.3	-2.4	18.34
Direct Verbal	23	-4.7	6.7	2.0	23.81

NOTE: Initial Binet IQ, Peabody IQ, and ITPA total language age difference scores (in months) were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

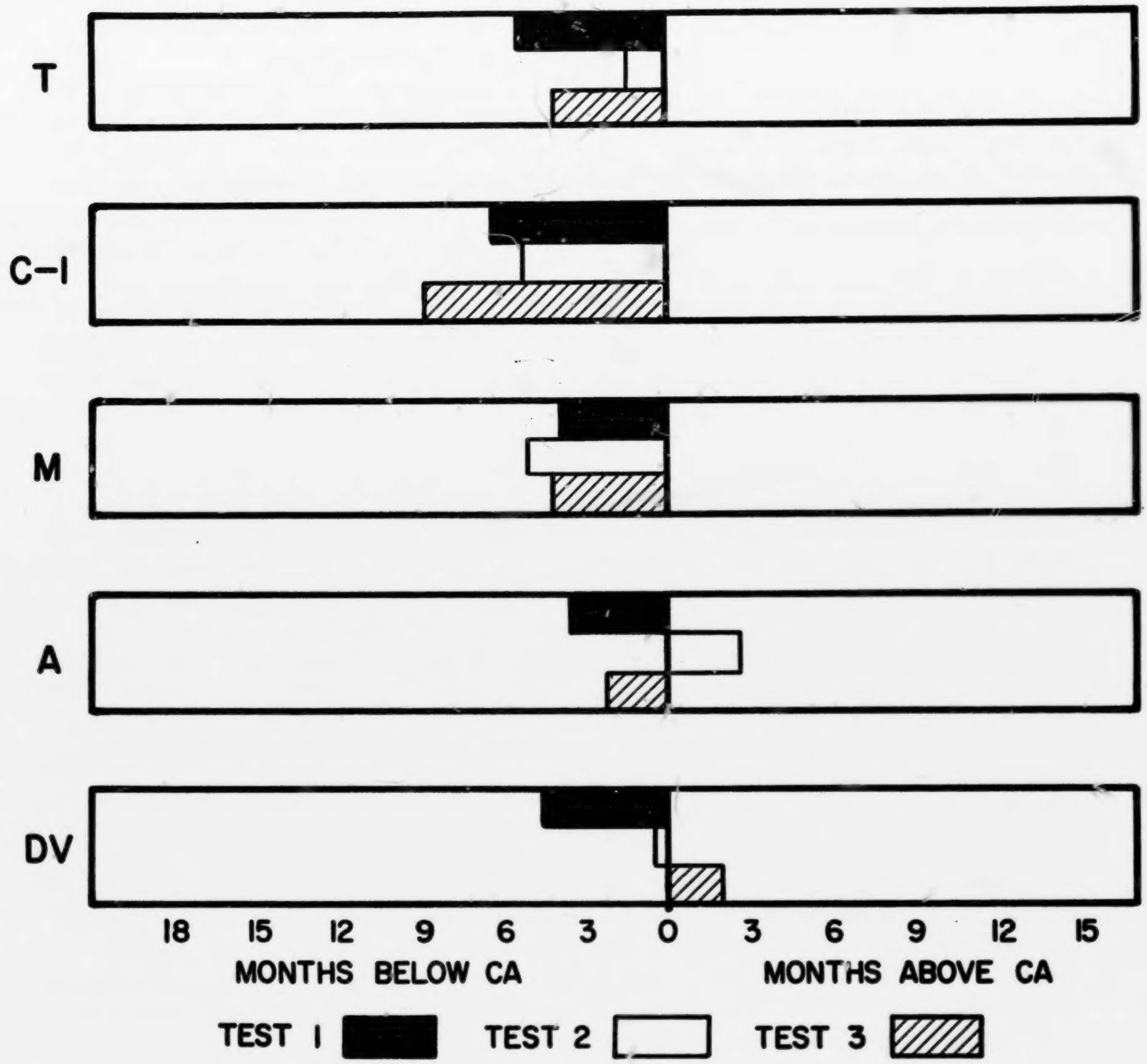
Group	C-I 14.08	M 17.27	T 17.87	A 18.34	DV 23.81
		Differences			
C-I		3.19	3.79	4.26	8.73*
M			.60	1.07	6.54*
T				.47	5.94*
A					5.47*
Table Value		2.81	3.38	3.71	3.94
Corrected Table Value		4.23	5.09	5.58	5.93

$\sqrt{MS_{\text{within/harmonic mean}}} = 1.505$

*Significant difference at .05 level

Summary: The Direct Verbal group was significantly higher than the other four groups which did not differ significantly from each other.

FIGURE 16
ITPA TOTAL DIFFERENCE SCORE MEANS
FIVE GROUPS FOR TWO YEARS



On the three subtests reflecting verbal expressive abilities (the subtests of major initial deficit) the Direct Verbal group made very large gains (10 to 17 months in excess of the interval between tests one and three) which were far in excess of the median change.[9] The gains of the Ameliorative group were more modest but exceeded the median change on each of these three subtests. The other three groups did not perform with this consistency in this critical area. The Traditional group made gains which exceeded four months on two of the three subtests and regressed slightly on the third. The gains of the Montessori group exceeded the median change on only one subtest. The Community-Integrated group made gains which exceeded four months on one subtest and a negligible gain and regression on the other two tests.

Direct Verbal children moved in a positive direction on eight of the nine ITPA subtests. The range of this upward movement was from .9 to 16.8 months and exceeded the median change in six instances. Their one loss was negligible (.2 months). The Ameliorative group moved in a positive direction on six of the nine subtests. The range was from 1.2 to 8.5 months and exceeded 4.0 months in three instances. Its three regressions ranged from .3 to 2.0 months. The Traditional children made gains on six of the nine subtests, ranging from .9 to 6.8 months. In two instances these gains exceeded the median change. One of their three losses which ranged from .8 to 5.4 months exceeded the median. The Montessori group moved in a positive direction on six of the nine subtests. Their gains ranged from .9 to 6.7 months and in three instances exceeded 4.0. On three subtests its losses ranged from 1.7 to 5.4 months, and two of these exceeded the median. The Community-Integrated group made gains (from 1.6 to 5.2 months) on only three of the nine subtests and two of these exceeded 4.0 months. Its six losses ranged from 16 to 8.2 months; five were greater than the median change.

Over the two-year period the Direct Verbal group consistently made substantial gains which resulted in a nondeficit test-three performance on all ITPA subtests. This group was, in fact, more than six months above its chronological age on three subtests. The Ameliorative group made no appreciable regressions but its gains were more modest. On five subtests the Ameliorative group was above its chronological age at test three, but four major deficits (6 to 12 months) remained. The gains of the Traditional group were not of sufficient magnitude to result in any test-three performance above chronological age, and three of these deficits were of major proportions. The performance of the Montessori group was somewhat more erratic than that of the Traditional group.

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[9] A gain or loss in excess of 4.0 months was chosen as a descriptive evaluation point since in half of the instances mean language age difference scores for the five groups were altered to that extent.

On three subtests major deficits remained, but on three subtests the Montessori group obtained scores above its chronological age. The first-year pattern of the Montessori group tended to be regressive, but only the Montessori group, of the groups who attended public kindergarten, showed gains the second year. The Community-Integrated group, on the other hand, demonstrated a relatively small gain the first year and suffered sizable regressions the second year. At test three the Community-Integrated group had major deficits on eight subtests, two of which exceeded twelve months.

This relative ranking based on ITPA subtest performance was consistent with the results of the discriminant analysis (Table 38) which indicated a superior performance by the Direct Verbal group followed by that of the Ameliorative group. The Montessori and Traditional groups were similar and represented a mid-point between the highest performance (Direct Verbal) and the lowest (Community-Integrated).

Visual Perception

The Frostig Developmental Test of Visual Perception was given to the five groups at the time of the second and third batteries. At the time of test three the Traditional group was significantly lower than the other four groups (Table 39). The Traditional group made no progress during the second year while the Montessori and Community-Integrated groups made substantial growth in this area during their year in public kindergarten. The Ameliorative group, which had been significantly superior at test two, showed modest but continued growth. The mean of the Direct Verbal group which had ranked second at test two now closely approximated that of the Ameliorative group.

Frostig (1964) suggests that children whose scores fall in the lowest quartile (a perceptual quotient of 90 or below) will experience difficulty in school adjustment and recommends remedial training for these children. The percentages of children obtaining such scores over the two-year period are presented in Table 40. The number of children in the lowest quartile in the Community-Integrated and Montessori groups was substantially reduced during the kindergarten year. Although the Traditional group had made modest progress during the preschool year, no further reduction was shown the second year. Both structured groups (Direct Verbal and Ameliorative) made substantial and continuing progress over the two-year period. Children in the public kindergarten did indeed make gains in this area; however, the groups which participated in the structured academically-oriented programs had a considerably smaller percentage of children prone to reading failure, to the extent that reading failures are related to visual perceptual inadequacies.

Table 38

Discriminant Analysis
ITPA Subtests
Five Groups for Two Years

Variable	Raw coefficient
Auditory-Vocal Automatic	- .005570
Visual Decoding	.022450
Motor Encoding	- .009313
Auditory-Vocal Association	- .044024
Visual-Motor Sequencing	- .022558
Vocal Encoding	.007651
Auditory-Vocal Sequencing	.024279
Visual-Motor Association	- .038839
Auditory-Decoding	- .044969
Percent of Canonical Variation	69.95

Bartlett's Chi Square Test for Significance of Successive Canonical Variates

For roots 1-4 Chi Square = 58.75 with 36 df P less than .0098

Discriminant Function

Traditional	-10.586
Community-Integrated	- 9.371
Montessori	-10.716
Ameliorative	-11.311
Direct Verbal	-11.985

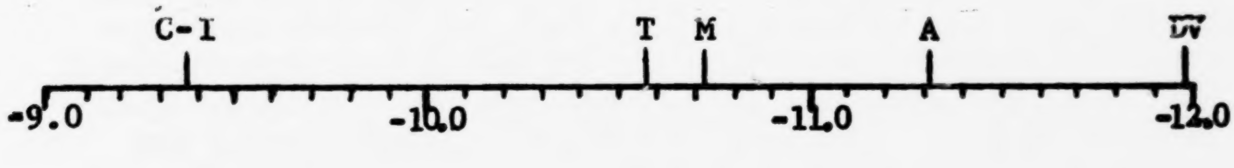


Table 39

Frostig Mean PQ
Five Groups at the End of Two Years

Group	N	Test 3	Covaried Mean
Traditional	25	82.7	19.30
Community-Integrated	16	93.2	30.73
Montessori	13	92.4	29.39
Ameliorative	24	101.2	37.01
Direct Verbal	23	98.3	33.74

NOTE: Initial Binet IQ, Peabody IQ, and ITPA total language age difference scores (in months) were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	T 19.30	M 29.39	C-I 30.73	DV 33.74	A 37.01
		Differences			
T		10.09*	11.43*	14.44*	17.71*
M			1.34	4.35	7.62
C-I				3.01	6.28
DV					3.27
Table Value		2.81	3.38	3.71	3.94
Corrected Table Value		6.94	8.34	9.16	9.73

$\sqrt{MS_{\text{within/harmonic mean}}} = 2.469$

*Significant difference at .05 level

Summary: The Ameliorative, Direct Verbal, Community-Integrated, and Montessori groups, which did not differ significantly from each other, were significantly higher than the Traditional group.

Table 40

Frostig Perceptual Quotient
Children in the Lowest Quartile
Five Groups for Two Years

Group	N	Test 1*	Test 2	Test 3
T	25	96%	76%	76%
C-I	16	--	81%	50%
M	13	--	77%	31%
A	24	75%	21%	12%
DV	23	91%	43%	22%

*Test 1 data were not available for the Community-Integrated and Montessori groups and for the second class unit of the Direct Verbal group. See Visual Perception first year results, page 90.

School Readiness

The Metropolitan Readiness Tests were given to the five groups at the time of the second and third test batteries. The reading readiness performance of the Ameliorative group was significantly higher than those of the other groups (Table 41). This result is rather surprising in view of the Direct Verbal group's superiority in intellectual functioning (Binet) and language development (ITPA). The failure of the Direct Verbal group to achieve a performance superior to those of the other groups, especially the three groups who attended public kindergarten only, is puzzling since its curriculum included an intensive two-year reading program. It may be that the techniques used in early reading instruction in the Direct Verbal program did not equip the children for traditional readiness tasks but will prove to have been effective when reading ability is evaluated in elementary school. A major intent of the Ameliorative supportive program had been to prepare children for formal reading instruction, and this focus appropriately developed reading readiness skills as measured by the Metropolitan.

The percentages of children who fell into the five Metropolitan reading readiness categories are presented in Table 42. Only children in the Ameliorative program (38%) achieved a superior reading readiness status, and 67% of the children in this group were rated high normal and above. No child in the other four programs earned a superior rating, and from 15 to 31% of the children in these groups were in the high normal range. Nearly equal percentages of the children in these four groups fell in the high, average, and low ranges. The favorable reading prediction for the large number of children in the Ameliorative program is complemented by the few children who received low-normal ratings, less than one-fourth the percentage of any other group.

Table 41

Metropolitan Reading Readiness Mean Raw Score
Five Groups at the End of Two Years

Group	N	Test 3	Covaried Mean
Traditional	25	48.4	10.35
Community-Integrated	16	47.2	9.41
Montessori	13	48.6	10.27
Ameliorative	24	56.5	17.51
Direct Verbal	23	50.0	11.58

NOTE: Initial Binet IQ, Peabody IQ, and ITPA total language age difference scores (in months) were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	C-I	M	T	DV	A
	9.41	10.27	10.35	11.58	17.51
Differences					
C-I		.86	.94	2.17	8.10*
M			.08	1.31	7.24*
T				1.23	7.16*
DV					5.93*
Table Value		2.81	3.38	3.71	3.94
Corrected Table Value		3.81	4.58	5.03	5.34

$\sqrt{MS_{\text{within}}/\text{harmonic mean}} = 1.356$

*Significant difference at .05 level

Summary: The Ameliorative group was significantly higher than the other four groups which did not differ significantly from each other.

Table 42

Metropolitan Reading Readiness Status
Five Groups at the End of Two Years

	Reading Readiness Status				
Group	Poor Risk	Low Normal	Average	High Normal	Superior
Traditional	0%	36%	36%	28%	0%
Community-Integrated	0%	38%	31%	31%	0%
Montessori	0%	38%	46%	15%	0%
Ameliorative	0%	8%	25%	29%	38%
Direct Verbal	0%	35%	35%	30%	0%

On the Metropolitan Number Readiness Test the Ameliorative and Direct Verbal groups were significantly higher at test three than the other groups (Table 43). The relative positions of the five groups at test three were essentially the same as they had been at test two, and all groups approximately doubled their test-two raw scores during the second year. The percentages of children who fell into the five Metropolitan number readiness categories are presented in Table 44. A substantially higher percentage of the children in the Ameliorative group (83%) achieved a superior number readiness status; however, the percentages of children in the Ameliorative and Direct Verbal groups who were rated high normal and above (91%) were identical and higher than those of the other three groups (48 to 62%). The performance of the two structured groups reflects the highly specific mathematics curricula of the Ameliorative supportive and the Direct Verbal programs. Apparently disadvantaged children of preschool and kindergarten age profit from academically-oriented instruction in mathematics, and both programs seemed appropriate and effective with these children.

Table 43

Metropolitan Number Readiness Mean Raw Score
Five Groups at the End of Two Years

Group	N	Test 3	Covaried Mean
Traditional	25	12.8	-11.78
Community-Integrated	16	14.0	-10.28
Montessori	13	14.1	-10.52
Ameliorative	24	21.0	- 4.03
Direct Verbal	23	18.9	- 5.75

NOTE: Initial Binet IQ, Peabody IQ, and ITPA total language age difference scores (in months) were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	T -11.78	M -10.52	C I -10.28	DV -5.75	A -4.03
Differences					
T		1.26	1.50	6.03*	7.75*
M			.24	4.77*	6.49*
C-I				4.53*	6.25*
DV					1.72
Table Value		2.81	3.38	3.71	3.94
Corrected Table Value		2.37	2.86	3.14	3.33

$\sqrt{MS_{within}/harmonic\ mean} = .845$

*Significant difference at .05 level

Summary: The Ameliorative and Direct Verbal groups, which did not differ significantly from each other, were significantly higher than the Community-Integrated, Montessori, and Traditional groups.

Table 44

Metropolitan Number Readiness Status
Five Groups at the End of Two Years

	Number	Readiness	Status		
Group	Poor Risk	Low Normal	Average	High Normal	Superior
Traditional	0%	4%	48%	40%	8%
Community-Integrated	0%	12%	25%	62%	0%
Montessori	0%	8%	31%	46%	15%
Ameliorative	0%	4%	4%	8%	83%
Direct Verbal	0%	0%	9%	39%	52%

Summary of Results

The children who participated in the Traditional, Community-Integrated, and Montessori programs the first year and who attended only the public kindergarten the second year generally demonstrated the least progress. The performance of the Traditional group at the end of the first year more nearly approximated those of the two structured groups than those of the Community-Integrated and Montessori groups which changed little during the preschool intervention. The regression of the Traditional group and the modest progress of the Montessori group during the second year (the kindergarten year) resulted in similar test-three performances. The Community-Integrated group regressed substantially in important areas during the second year. The children in the Ameliorative group made progress equal or superior to that of the Direct Verbal group during the first year but regressed substantially in critical areas the second year. The one-hour supportive program was successful in fostering further development of school readiness (Metropolitan) and visual perception (Frostig). Only the Direct Verbal group made consistent and continued progress in all areas over the two-year period.

CONCLUSIONS AT THE END OF THE KINDERGARTEN YEAR

Only at the end of the first year of the study can differential results be directly attributed to the specifics of preschool intervention, since only then were the five programs comparable in terms of class unit composition, teacher-pupil ratio, and time. Only limited conclusions, therefore, can be drawn from the longitudinal data, and the second year of this study cannot be viewed merely as a follow-up of the five preschool programs. For those interested in preschool programming for disadvantaged children, the data obtained at the end of the preschool year must remain of primary relevance.

It seems clear that one year of preschool programming, no matter how immediately effective, did not equip disadvantaged children to maintain performance in the kindergarten setting. One could hardly have expected the children in the Ameliorative program to have made greater gains during the preschool year; yet, the picture they present the following year in the critical area of language development is distressing. Regardless of the progress made in preschool by the four groups of children which attended public kindergarten, their relative performances deteriorated during the second year, and it does not seem reasonable to attribute this regression to the inadequacies of preschool experience. Rather, the efficacy of kindergarten programming for disadvantaged children seems open to question. The indictment is not merely of traditional programming, since children in the Traditional preschool did fairly well in language development, but of moving too early to the high pupil-teacher ratio of the public kindergarten. Since one of the principal findings of the first year was that intensive teacher-child interaction is critical to maximum language development and since this kind of interaction cannot occur with the teaching ratio of the public kindergarten, the deterioration in language development is not surprising. Only children in the Direct Verbal program, which maintained a low pupil-teacher ratio and intensive pupil-teacher interaction the second year, made continuing progress in language development over the two-year period.

The Montessori program as implemented in this two-year study did not alter performance level in appreciable ways. The regressive pattern in verbal expressive abilities shown the first year by the Montessori children was reversed during the kindergarten year, and only this group of the four groups which attended public kindergarten made gains in this area. It may be that the focus of the Montessori program on sensory-motor involvement as the basic mode in which conceptual and linguistic abilities develop provided an appropriate base for subsequent language development in the kindergarten setting. However, since the test-three deficit of this group in verbal expressive abilities approximated its initial deficit, only the continuing progress of these children can support this position. The large and continuing IQ gain of the low stratum in the Montessori group suggests that this program was relatively effective in establishing improved intellectual functioning with children who had initially indicated limited potential.

In the relatively unstructured setting of the Community-Integrated preschool, the disadvantaged children did not reciprocate in verbal interactions at any significant level and failed to incorporate the language model of their advantaged peers. Like the Montessori children, the Community-Integrated children demonstrated no appreciable progress in language development during the preschool year, but unlike the Montessori children who made gains in verbal expressive abilities during the kindergarten year, the Community-Integrated children demonstrated substantial regressions in language development during the second year of the study. It may be that the pattern of uninvolvement adopted by the Community-Integrated children during their preschool year continued in the traditional kindergarten setting and further inhibited language development.

During the first year of the study, Ameliorative programming was appropriate and highly effective, and children made remarkable progress in all areas, particularly those of initial inadequacy. This encouraging educational prognosis contributed to a shift in emphasis from language development to school readiness in the one-hour supportive program. The marked regression in verbal expressive abilities experienced by these children during the kindergarten year suggests that this shift in emphasis was ill advised or at least premature. The additional one-hour supportive program did indeed promote superior academic readiness but failed to maintain the level of language functioning achieved in the Ameliorative preschool.

Only children who attended the Direct Verbal preschool were provided low pupil-teacher ratios and intensive language programming over the two-year period, and only these children made continued growth in all aspects of the test battery. The second-year IQ gains of the low and middle strata are particularly encouraging as are the remarkable two-year gains in verbal expressive abilities made by children in this group. Only in the area of reading readiness did these children fail to achieve the superior performance, and this study offers no direct evidence to support the early introduction of reading instruction to disadvantaged children.

A Follow-Up of Three of the Five Preschool Interventions: Evaluations over Three Years

Merle B. Karnes, Audrey S. Hodgins
and James A. Teska

Because all intervention programs were not initiated during the first year of the study, data at the end of first grade are not available for the Montessori and Community-Integrated groups or for the second Direct Verbal class unit. Follow-up data are, however, available for the Traditional group (N=25), the Ameliorative group (N=24), and the first class unit of the Direct Verbal group (N=10). The N's for the Traditional and Ameliorative groups are the same as those reported in the preceding study, "The Effects of Five Preschool Interventions: Evaluations over Two Years." The available N for the Direct Verbal group, however, is reduced from 23 to 10, and conclusions based on data obtained during the third year for the Direct Verbal group must be tentative. This reduced N and the absence of data from the Montessori and Community-Integrated groups required a re-analysis of all data involved in comparisons among the three groups over the period of three years. Since the major implications of data for the first two years were discussed in the preceding report, this second presentation of preschool and kindergarten data is given in appendixes C and D. The major intent of the three-year study will be to evaluate the status of the three groups at the completion of first grade.

Evaluations were made in the following areas prior to the intervention, at the end of the preschool year, at the end of the kindergarten year, and at the end of first grade:

1. Intellectual functioning as measured by the 1960 Stanford-Binet Individual Intelligence Scale, Form L-M.

2. Language development as measured by the Illinois Test of Psycholinguistic Abilities, experimental edition, 1961.

3. Visual perception as measured by the Frostig Developmental Test of Visual Perception.

In addition, the Peabody Picture Vocabulary Test was included in the first three batteries, the Metropolitan Readiness Tests were administered at the end of the preschool and kindergarten years, and the California Achievement Tests, Lower Primary Form W, were given at the end of the first grade.

The first intervention embodied the traditionalist point of view: a nursery school experience which worked in conventional ways to improve the personal, social, motor, and general language development of the children was followed by a traditional kindergarten under the auspices of the public school. The Direct Verbal program radically departed from the established view: The traditional preschool and kindergarten were seen as inadequate and inappropriate to the task of insuring the academic competencies of the disadvantaged child, and the experimental Direct Verbal preschool was provided for the two years prior to first grade. The Ameliorative program represented a middle ground: Amelioration of deficits related to school inadequacies began during the preschool year so that the disadvantaged child might benefit fully from the traditional kindergarten. The public kindergarten with a one-hour supportive program, it was assumed, would then be an appropriate prelude to first grade.

Children from the three intervention programs attended first-grade classes under the sole supervision of the public schools. All but ten children attended racially integrated schools; consequently, many of the children participating in this study were bussed to schools in socioeconomic neighborhoods other than those in which they lived. Seldom were more than two children from any intervention program assigned to the same classroom. No further research intervention was provided, and all children were given the fourth battery of tests in the late spring of the third year of the study.

The initial composition of the three groups included in this longitudinal evaluation is summarized in Table 1.

RESULTS AT THE END OF FIRST GRADE

Statistical Procedure

Statistical treatment of the total battery data (Binet, ITPA total, Frostig, and California Achievement Tests) employed a multivariate analysis of covariance using initial Binet, ITPA total, Peabody, and Frostig scores as covariates. Since the California was not given until the end of the third year of the study, scores from this instrument were not available for use as covariates. A separate multivariate analysis of covariance of ITPA subtest data used the initial scores from the nine subtests as covariates. When multivariate F's were significant, Newman-Keuls tests at the .05 level were conducted in those instances when univariate F's were also significant. The small N (10) in the Direct Verbal group mitigates against statistical difference and limits the discussion of differences among the groups.

Total Battery Analysis

The F ratio for the multivariate test of equality of mean vectors for the six instruments in the test-four battery was

Table 1

Initial Group Composition

Group	N*	Mean Binet CA	Mean Binet IQ	Intelligence Strata Means						Race		Sex	
				High	N	Middle	N	Low	N	Caucasian	Negro	M	F
Traditional	25	52.4	94.4	108.6	7	93.9	10	82.6	8	9	16	15	10
Ameliorative	24	52.1	96.2	107.0	8	95.7	9	84.6	7	7	17	11	13
Direct Verbal	10	51.1	96.6	111.0	3	93.5	4	86.3	3	3	7	4	6

*Sixteen children withdrew from the programs before the end of the third year (battery four), and no data for these children are included in this study.

significant at the .0064 level (Table 2). Univariate F's indicated significant differences among the three groups in California Reading, Arithmetic, and Language grade level. There were no significant differences among the groups on Binet IQ, Frostig PQ, and ITPA total language age difference score.

School Achievement

Although important interim evaluations were made at the end of the preschool and kindergarten years, school achievement at the end of first grade was understood to be a critical criterion in assessing program effectiveness. The reading achievement of the Ameliorative and Direct Verbal groups as measured by the California Achievement Tests was significantly higher than that of the Traditional group (Table 3). The very similar performances of the Direct Verbal and Ameliorative groups are of particular interest since these programs relied on rather different approaches to reading during the first two years of the study. Two years of reading instruction in the Direct Verbal program prior to first grade seem to have been only as effective as the extensive readiness preparation in the Ameliorative program in producing accelerated reading development. This study provides little evidence to support the introduction of early reading programs for disadvantaged children.

The California reading test yields separate grade level scores for vocabulary and comprehension. In the Traditional and Ameliorative groups, these scores closely approximated the total reading means (Table 4). The comprehension score of the Direct Verbal group, however, was nearly a half year below its vocabulary score. This discrepancy may relate to the emphasis given to the teaching of reading subskill mechanics which prepared the children to perform well on the vocabulary section of the test (single word recognition) but did not equally equip them to derive meaning from sentences as required by the comprehension section. The Direct Verbal group, in fact, did little better than the Traditional group on the comprehension test.

The mean reading level of the Traditional group was essentially at grade level, an encouraging result for a group of disadvantaged children of normal ability. The distribution of reading scores within this group is, however, disconcerting since nearly half of these children demonstrated limited reading ability, scoring below a grade level of 1.5 (Table 5). The mean reading level of the Ameliorative and Direct Verbal groups, nearly a half year above grade level, was indeed a remarkable achievement for these disadvantaged children. Further, in these two groups very few children seemed to have marked difficulty in learning to read; in fact, over half were reading at or above the second-grade level.

Table 2

Total Battery Multivariate Analysis of Covariance
Three Groups for Three Years

F ratio for multivariate test of equality of mean vectors = 2.5237

dr = 12 and 94 P less than .0064

Variable	Between Mean Square	Univariate F	P less than
Binet IQ	203.2559	2.1249	.1298
Frostig PQ	261.1506	2.6904	.0773
California Reading Grade Level	111.8742	3.6928	.0317
California Arithmetic Grade Level	47.6488	6.0655	.0043
California Language Grade Level	64.6430	4.8049	.0122
ITPA Total Language Age Difference Score*	111.0188	2.1584	.1258

NOTE: Initial Binet IQ, Peabody IQ, Frostig PQ, and ITPA total language age difference scores (in months) were used as covariates.

*To relate language age to chronological age, a difference score (in months) was computed by subtracting a child's chronological age at the time of testing from his language age.

Table 3

Reading
California Achievement Tests
Three Groups at the End of First Grade

Group	N	Actual Grade Placement Mean at Time of Test	Reading Grade Level Mean	Covaried Mean
Traditional	25	1.74	1.67	-24.01
Ameliorative	24	1.74	2.12	-20.08
Direct Verbal	10	1.72	2.17	-19.86

NOTE: Initial Binet IQ, Peabody IQ, Frostig PQ, and ITPA total language age difference score (in months) were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	T	A	DV
	-24.01	-20.08	-19.86

Differences

T	3.93	4.15
A		.22
Table Value	2.84	3.41
Corrected Table Value	3.85	4.62

$\sqrt{MS_{\text{within/harmonic mean}}} = 1.355$

Summary: The Newman-Keuls Test revealed no significant differences among groups, although the univariate F was significant at the .0317 level (Table 2). Since the univariate F was significant and since the covaried means of the Ameliorative and Direct Verbal groups were similarly higher than the covaried mean of the Traditional group, it is reasonable to conclude that the means of the Ameliorative and Direct Verbal groups were significantly higher than that of the Traditional group.

Table 4

California Achievement Tests
Reading Vocabulary and Comprehension
at the End of First Grade

Group	N	Vocabulary Grade Level Mean	Comprehension Grade Level Mean
Traditional	25	1.64	1.66
Ameliorative	24	2.12	2.09
Direct Verbal	10	2.24	1.75

Table 5

California Achievement Tests
Distribution of Reading Scores
at the End of First Grade

Group	N	Grade Level			
		Below Average 1.0-1.4	Average 1.5-1.9	Above Average 2.0-2.4	Superior 2.5-3.4
Traditional	25	48%	28%	8%	16%
Ameliorative	24	8%	42%	21%	29%
Direct Verbal	10	10%	20%	50%	20%

NOTE: These distribution categories were constructed on the basis of the actual grade placement of the children (1.7) at the time of the test.

Since such divergent approaches to reading yielded nearly identical results, elements common to these two programs and absent in the Traditional program are of some interest. Both the Ameliorative and Direct Verbal programs gave major emphasis to language development through intensive, highly structured programming. Learning tasks were explicitly designed to achieve immediate goals, and the child's repeated participation in specific, verbal responses was required in direct teacher-child interactions.

The California language test assesses capitalization, punctuation, word usage, and spelling skills and bears little relation to language development as it is discussed elsewhere in this report. The performance of the Ameliorative group was significantly higher on this language test than that of the Traditional group (Table 6). The performance of the Direct Verbal group approximated that of the Ameliorative group but failed to achieve significance. Since the skills required for successful performance on this test were not taught at the preschool or kindergarten levels (with the exception of limited spelling instruction for Direct Verbal children), the differential nature of this performance may reflect the superiority of the Ameliorative and Direct Verbal groups in general school readiness as evidenced on the Metropolitan Readiness Tests at the end of the kindergarten year (Appendix D, Tables 5 and 6).

The results of the Metropolitan Number Readiness Test at the end of the kindergarten year indicated that the two structured groups were better prepared for the more formal work of first-grade mathematics. The Ameliorative and Direct Verbal groups were significantly higher than the Traditional group on the California arithmetic test at the end of the first grade, confirming this prediction (Table 7). The arithmetic performance of the Traditional group, nearly three months below grade level, is a somewhat discouraging prognosis for a group of disadvantaged children of average ability who had both a preschool and a kindergarten experience prior to first-grade instruction. Over half of the children in this group were performing substantially below grade placement at the time of the test (Table 8). Although the arithmetic performance of the Ameliorative and Direct Verbal groups did not parallel the acceleration shown in reading by these children, it was, nevertheless, at grade level. Further, less than 20% of these children can be considered to have serious difficulty in arithmetic. Disadvantaged children apparently profited from academically-oriented instruction in mathematics at the preschool and kindergarten levels, and the Ameliorative and Direct Verbal curricula, though rather different in their basic assumptions, seemed equally appropriate and effective in fostering first-grade arithmetic achievement.

Intellectual Functioning

The Binet performances of the three groups were clearly differentiated over the three year period (Figure 1, Table 9). The performance of the Ameliorative and Direct Verbal groups was significantly superior to that of the Traditional group at the end of the preschool year (Appendix C, Table 2). At the end of the kindergarten year, the Binet performance of the Direct Verbal group was significantly superior to that of the other two groups (Appendix D, Table 2). The Ameliorative group was very nearly significantly higher than the Traditional group. At the end of the third year of the study, when all children were completing the first grade, there were no significant differences among the three groups (Table 10). The modest preschool gain (8 points) of the Traditional group remained relatively stable during the following

Table 6

Language
California Achievement Tests
Three Groups at the End of First Grade

Group	N	Actual Grade Placement Mean at Time of Test	Language Grade Level Mean	Covaried Mean
Traditional	25	1.74	1.70	-16.61
Ameliorative	24	1.74	2.09	-13.35
Direct Verbal	10	1.72	2.00	-14.21

NOTE: Initial Binet IQ, Peabody IQ, Frostig PQ, and ITPA total language age difference score (in months) were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	T -16.61	DV -14.21	A -13.35
		Differences	
T		2.40	3.29*
DV			.86
Table Value		2.84	3.41
Corrected Table Value		2.56	3.08

$\sqrt{MS_{within}/\text{harmonic mean}} = .903$

*Significant difference at .05 level

Summary:
1. The Ameliorative group was significantly higher than the Traditional group but not significantly higher than the Direct Verbal group.
2. The Direct Verbal and Traditional groups did not differ significantly from each other.

Table 7

Arithmetic
California Achievement Tests
Three Groups at the End of First Grade

Group	N	Actual Grade Placement Mean at Time of Test	Arithmetic Grade Level Mean	Covaried Mean
Traditional	25	1.74	1.49	-11.50
Ameliorative	24	1.74	1.80	- 8.85
Direct Verbal	10	1.72	1.80	- 9.00

NOTE: Initial Binet IQ, Peabody IQ, Frostig PQ, and ITPA total language age difference score (in months) were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	T	DV	A
	-11.50	-9.00	-8.85

Differences

T		2.50*	2.65*
DV			.15
Table Value		2.84	3.41
Corrected Table Value		1.96	2.35

$\sqrt{MS_{within}/\text{harmonic mean}} = .690$

*Significant difference at .05 level

Summary: The Ameliorative and Direct Verbal groups, which did not differ significantly from each other, were significantly higher than the Traditional group.

Table 8

California Achievement Tests
Distribution of Arithmetic Scores
at the End of First Grade

Group	N	Grade Level			
		Very Low .5-.9	Below Average 1.0-1.4	Average 1.5-1.9	Above Average 2.0-2.4
Traditional	25	8%	44%	32%	16%
Ameliorative	24	0%	17%	54%	29%
Direct Verbal	10	0%	20%	40%	40%

NOTE: These distribution categories were constructed on the basis of the actual grade placement of the children (1.7) at the time of the test.

Table 9

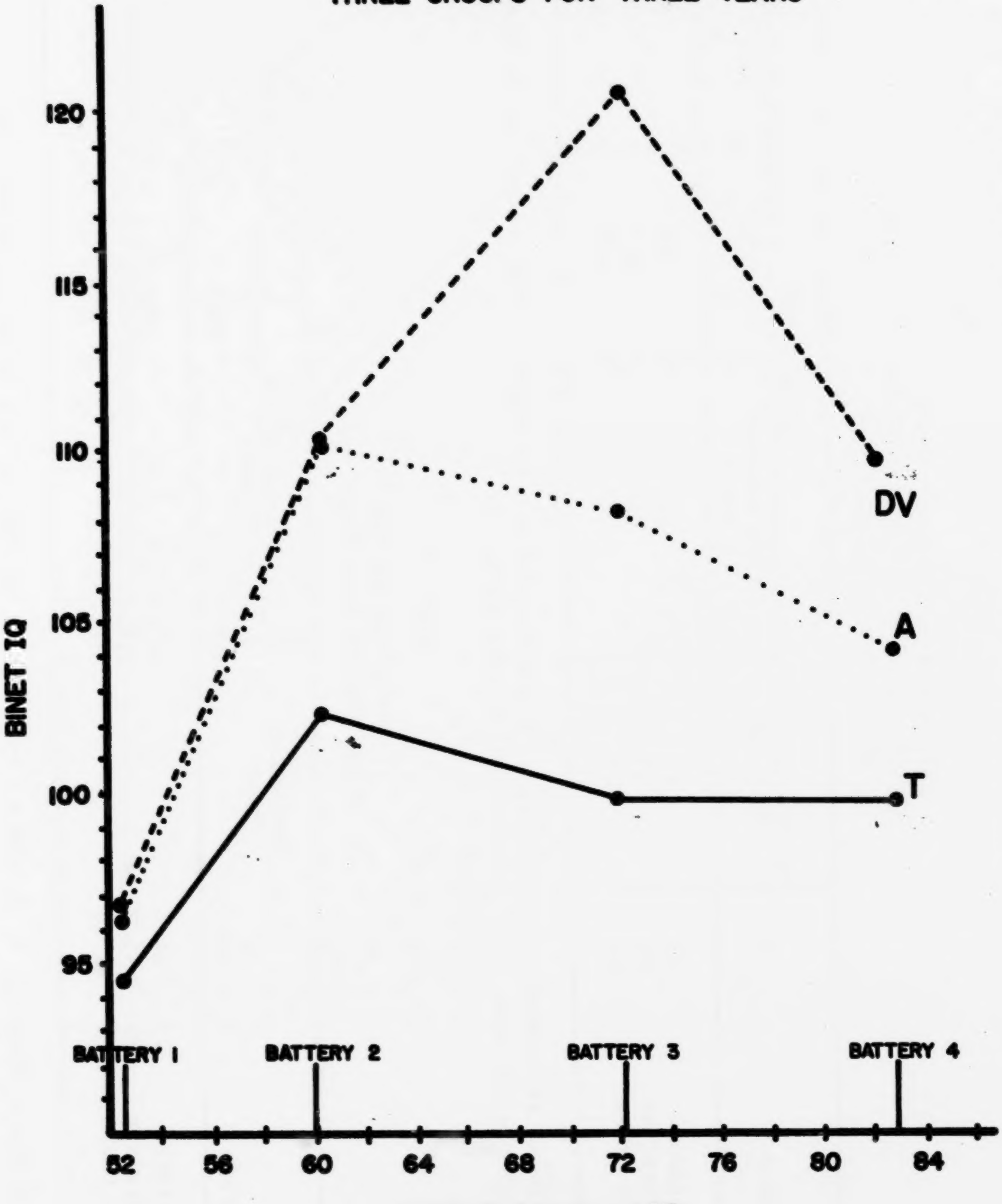
Stanford-Binet Mean IQ
Three Groups over Three Years

			Preschool Year		Kindergarten Year		First Grade	
Group	N	Test 1		Test 2		Test 3		Test 4
Traditional	25	94.4		102.6		100.0		100.0
Ameliorative	24	96.2		110.0		108.6		104.3
Direct Verbal	10	96.6		110.3		120.6		109.7

NOTE: IQ means (test 1, 2, 3, and 4) by race-sex categories are found in appendix E.

FIGURE I

BINET IQ
THREE GROUPS FOR THREE YEARS



NOTE: THE TIMES OF THE FOUR BATTERIES ARE PLOTTED AT THE MEAN BINET CHRONOLOGICAL AGE OF THE THREE GROUPS.

Table 10

Stanford-Binet Mean IQ
Three Groups for Three Years

Group	N	Test 1	diff.	Test 4	Covaried Mean
Traditional	25	94.4	5.6	100.0	-17.34
Ameliorative	24	96.2	8.1	104.3	-15.47
Direct Verbal	10	96.6	13.1	109.7	- 9.75

NOTE: Initial Binet IQ, Peabody IQ, Frostig PQ, and ITPA total language age difference score (in months) were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

two years (5 points at the end of the first grade). Although the one-hour supportive program was unsuccessful in fostering a further gain for the Ameliorative group, it may have been responsible for maintaining the relatively large preschool gain. The Ameliorative group did, however, lose 6 points of this gain during the kindergarten and first-grade years, retaining an 8 point gain at the end of the third year of the study. Only the Direct Verbal group received sustained special programming during the preschool and kindergarten years, and only the Direct Verbal group made large and continuing gains (13 and 10 points) during the first two years of the study. When special programming terminated and these children entered the first grade of the public schools, they experienced a sizeable loss (11 points).

Initially the IQ scores of one-third of the children in each intervention group placed them in high strata, 100 and above. At the end of the preschool year, nearly half of the children in the Traditional group scored in the high stratum, and this percentage remained remarkably stable during the following two years in the public schools (Table 11).

Table 11

High Intelligence Strata
Three Groups for Three Years

			Preschool Year	Kindergarten Year	First Grade
Group	N	Test 1	Test 2	Test 3	Test 4
T	25	28%	48%	48%	44%
A	24	33%	92%	75%	71%
DV	10	30%	90%	100%	50%

Nearly all children in the two structured programs scored 100 and above at the end of the preschool year. Approximately three-fourths of the children in the Ameliorative group remained in the high stratum the following two years. All ten children in the Direct Verbal group scored in the high stratum at test three; however, only half remained in that stratum at the end of first grade.

Approximately 20% of the children in the two structured programs gained twenty or more points at the end of first grade (Table 12); 8% of the children in the Traditional group made such gains. Sixty percent of the children in the Direct Verbal group, 46% of the children in the Ameliorative group, and 36% of the children in the Traditional group made gains of ten or more points. Only one of the ten children in the Direct Verbal group scored lower on test four than on test one; 20% of the children in the Ameliorative group and 28% of the children in Traditional group regressed.

Table 12

Distribution of IQ Gains
Test 1-4 (End of First Grade)

Test 1-4 Gain in IQ Points	Group					
	Traditional N=25		Ameliorative N=24		Direct Verbal N=10	
	%	N	%	N	%	N
35 to 39	0	(0)	0	(0)	10	(1)
30 to 34	4	(1)	0	(0)	0	(0)
25 to 29	0	(0)	4	(1)	0	(0)
20 to 24	4	(1)	17	(4)	10	(1)
15 to 19	8	(2)	4	(1)	10	(1)
10 to 14	20	(5)	21	(5)	30	(3)
5 to 9	16	(4)	21	(5)	30	(3)
0 to 4	20	(5)	12	(3)	0	(0)
- 1 to - 5	16	(4)	12	(3)	10	(1)
- 6 to -10	4	(1)	0	(0)	0	(0)
-11 to -15	4	(1)	4	(1)	0	(0)
-16 to -20	4	(1)	4	(1)	0	(0)

IQ gains by strata over the three-year period offer some of the most encouraging data of the study as well as some of the most disturbing (Table 13). The high loss (13 points) of the middle and low strata children in the Direct Verbal group during the first grade in the public schools was not shared by children in these strata in either the Traditional or the Ameliorative groups. The low strata children of the Ameliorative group, in fact, maintained their sizeable initial gain with remarkable consistency. Because the gains of the Ameliorative children in the low and middle strata were both substantial and stable, it seems justifiable to conclude that this program offered particular opportunities to develop the intellectual functioning of low-normal and slow-learning children. The Ameliorative preschool stressed physical mastery of a concept through manipulative experience accompanied by appropriate verbalizations -- a mode of instruction apparently suited to the children in these strata. The academic readiness work offered in the supportive program the second year not only maintained the gains in intellectual functioning made during the preschool year but seemed to provide the necessary thrust to sustain this level of performance again the third year when these

Table 13

Stanford-Binet IQ Mean Gains by Strata
Three Groups for Three Years

Group	Strata	N	Post-Preschool Test 1-2 diff.	Post-Kindergarten Test 1-3 diff.	Post-First Grade Test 1-4 diff.
Traditional	High	7	6.3	4.1	- 1.4
	Middle	10	8.9	5.1	10.1
	Low	8	9.0	7.4	6.3
Ameliorative	High	8	9.9	10.8	- .5
	Middle	9	15.7	12.0	10.7
	Low	7	16.0	14.7	14.7
Direct Verbal	High	3	11.3	21.7	15.3
	Middle	4	14.0	20.8	7.0
	Low	3	15.7	30.7	19.0

children were in the first grade with no special programming. Since the early amelioration of school inadequacies was the intent and design of the Ameliorative program, the magnitude and stability of these IQ gains is an endorsement of the effectiveness of this program.

The marked reversal in Binet performance experienced by the children in the lower two strata of the Direct Verbal group suggests difficulty in making a transition from intensive pupil-teacher interaction to large group instruction. Children in the Traditional group had never experienced such a high degree of teacher-pupil interaction. Although children in the Ameliorative group had been actively engaged in small group, teacher-directed instruction during their preschool year, the supportive program the second year (low pupil-teacher ratio) ran simultaneously with the public kindergarten (large group instruction) and may have provided a useful transition to the first-grade setting. It is, of course, also possible that the mode of instruction in the Direct Verbal program, so highly effective during the first two years of the study, was inappropriate to the public school setting. The dissonance between the specific child behavior required in the Direct Verbal program and the operation of the first-grade classroom may have been so great as to inhibit continuing intellectual development.

The IQ losses experienced only by the high strata children in both the Traditional and Ameliorative groups during first grade are of real concern and resulted in an IQ change in a negative direction over the three-year period. The modest gain (six points) of the Traditional high strata and the more substantial gain (ten points) of the Ameliorative high strata during the preschool year remained stable during the kindergarten year but were lost during the first grade. It is untenable to presume a factor common to both the Traditional and Ameliorative two-year interventions which explains such losses the third year. Rather, it seems reasonable to suppose that in important ways the public school failed these high strata children during the first grade. These children may have been judged by criteria based on preconceptions of what disadvantaged children are like and how they will perform in school, and instructional provisions may have been more inadequate for the high strata children than for the children in the other two strata.

The assumption that the public schools failed disadvantaged children with demonstrated potential is further supported by a consideration of the first-grade Binet performance of the 26 children from the three intervention programs who scored 110 and above at the end of the kindergarten year (6 of the 25 children in the Traditional group, 12 of the 24 children in the Ameliorative group, and 8 of the 10 children in the Direct Verbal group). Twenty-four of these 26 children scored lower on the test-four Binet than they had on test three, a mean loss of 9.2 IQ points. The school failures of disadvantaged children are commonly attributed to limited abilities or undeveloped potential, but the deterioration in the intellectual functioning of these 24 children seems to be a clear indictment of public school programming.

Language Development

The F ratio for the multivariate test of equality of mean vectors for the nine ITPA subtests on test four was nonsignificant (Table 14), and the nine subtest tables are presented in appendix F. The subtest performances of the three groups at the end of each of the three years of the study were essentially nondifferential (Appendix C, Table 8; Appendix D, Table 8). Significant subtest differences occurred only at the end of the preschool year when the performance of the Direct Verbal group was significantly higher than those of the Ameliorative and Traditional groups on Auditory-Vocal Association (Appendix C, Table 12) and when the performance of the Ameliorative group was significantly higher than those of the Direct Verbal and Traditional groups on Visual-Motor Association (Appendix C, Table 16).

The disadvantaged children in these three groups, as well as the children in all other similarly constituted groups throughout this project, demonstrated major initial deficits on three subtests: Vocal Encoding, Auditory-Vocal Automatic, and Auditory-Vocal Association. In addition to the specific aspects of language functioning measured, the ability to express oneself verbally is the common requisite for successful performance on these three subtests. During the preschool year all groups made good progress (7 to 12 months in excess of the program interval) on the Vocal Encoding test and substantially reduced the size of their initial deficits (Figure 2). The Traditional and Ameliorative groups regressed during the second year, and only the Direct Verbal group made continuing progress. At the completion of first grade, all groups again had major deficits. The test-four deficit of the Traditional group approximated its initial deficit while the test-four deficits of the Ameliorative and Direct Verbal groups were less than half their initial levels. On the Auditory-Vocal Automatic subtest only the Ameliorative group was nondeficit at the end of the preschool year (Figure 3). Although the Traditional group made modest progress (4 months) and the Direct Verbal group made somewhat better progress (7 months), substantial deficits remained. The Traditional and Ameliorative groups regressed during the second year, and only the Direct Verbal group made continued progress. At the completion of first grade, the deficits of the Traditional and Ameliorative groups approximated their large initial deficits. The Direct Verbal group maintained its nondeficit test-three performance. At the end of the preschool year, both the Direct Verbal and Ameliorative groups were nondeficit on the Auditory-Vocal Association subtest (Figure 4). The gain of the Direct Verbal group (14 months) doubled that of the Ameliorative group while the progress of the Traditional group

Table 14

ITPA Subtest Multivariate Analysis of Covariance
Three Groups for Three Years

F ratio for multivariate test of equality of mean vectors = .9442

df = 18 and 78 P less than .5303

Variable	Between Mean Square	Univariate F	P less than
Auditory-Vocal Automatic	377.8153	2.0619	.1386
Visual Decoding	956.2439	4.5786	.0153
Motor Encoding	243.7214	.7659	.4707
Auditory-Vocal Association	36.9944	.5928	.5569
Visual-Motor Sequencing	145.0325	1.0133	.3709
Vocal Encoding	7.8439	.0207	.9796
Auditory-Vocal Sequencing	205.5624	1.0532	.3570
Visual-Motor Association	78.0389	.2968	.7447
Auditory Decoding	102.2585	.5239	.5957

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

FIGURE 2
VOCAL ENCODING DIFFERENCE SCORE MEANS
THREE GROUPS FOR THREE YEARS

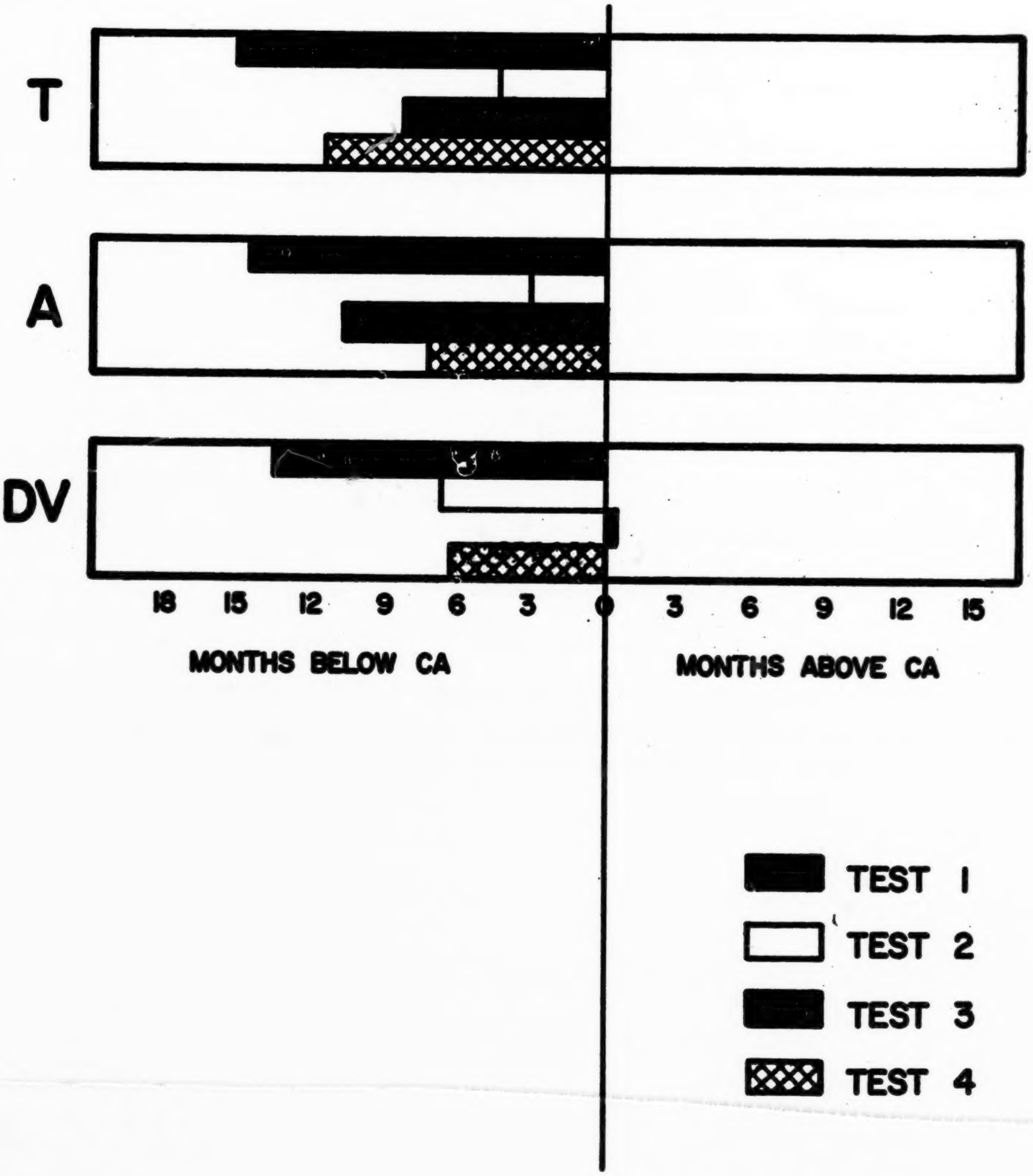


FIGURE 3

AUDITORY-VOCAL AUTOMATIC DIFFERENCE SCORE MEANS
THREE GROUPS FOR THREE YEARS

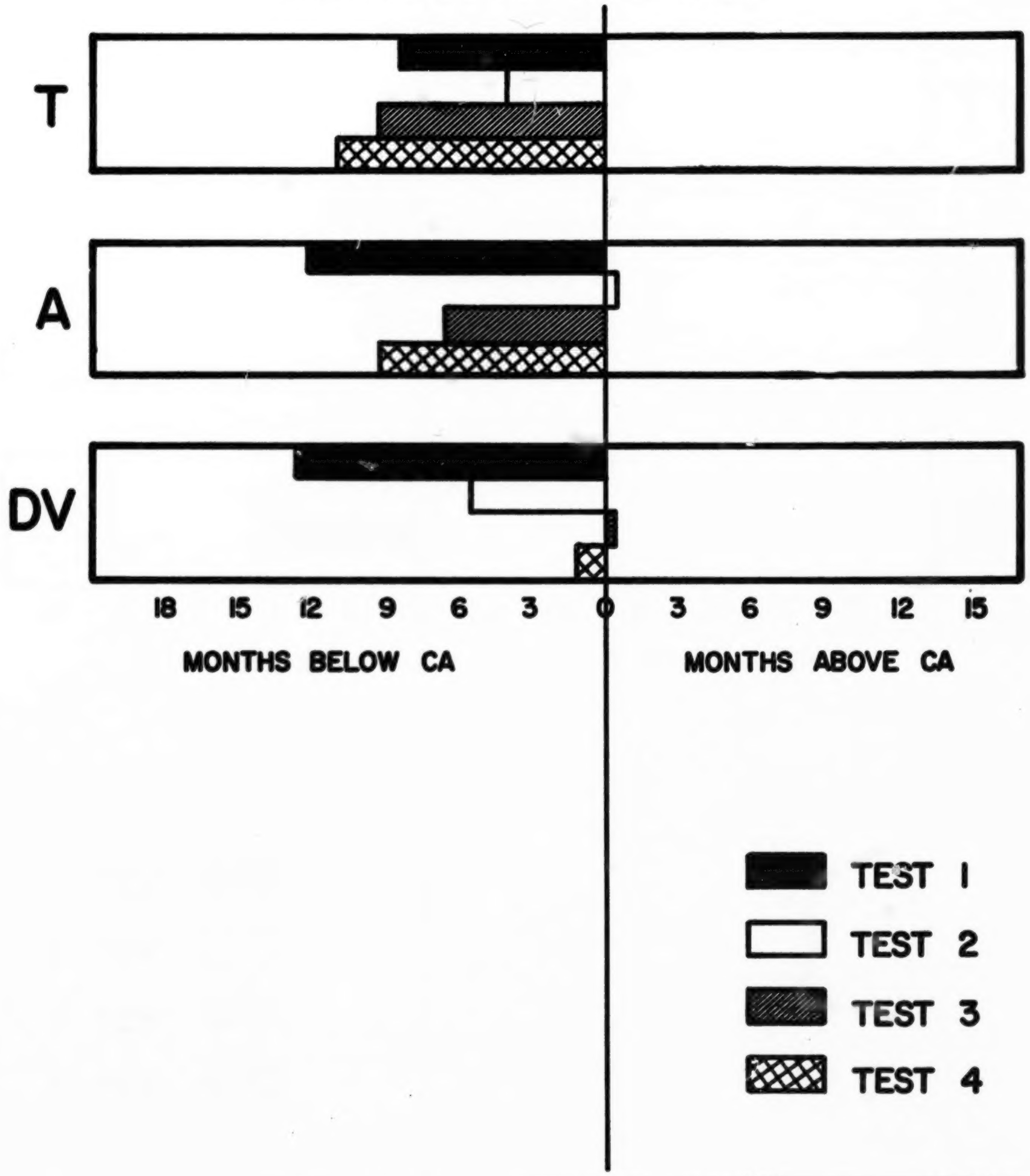
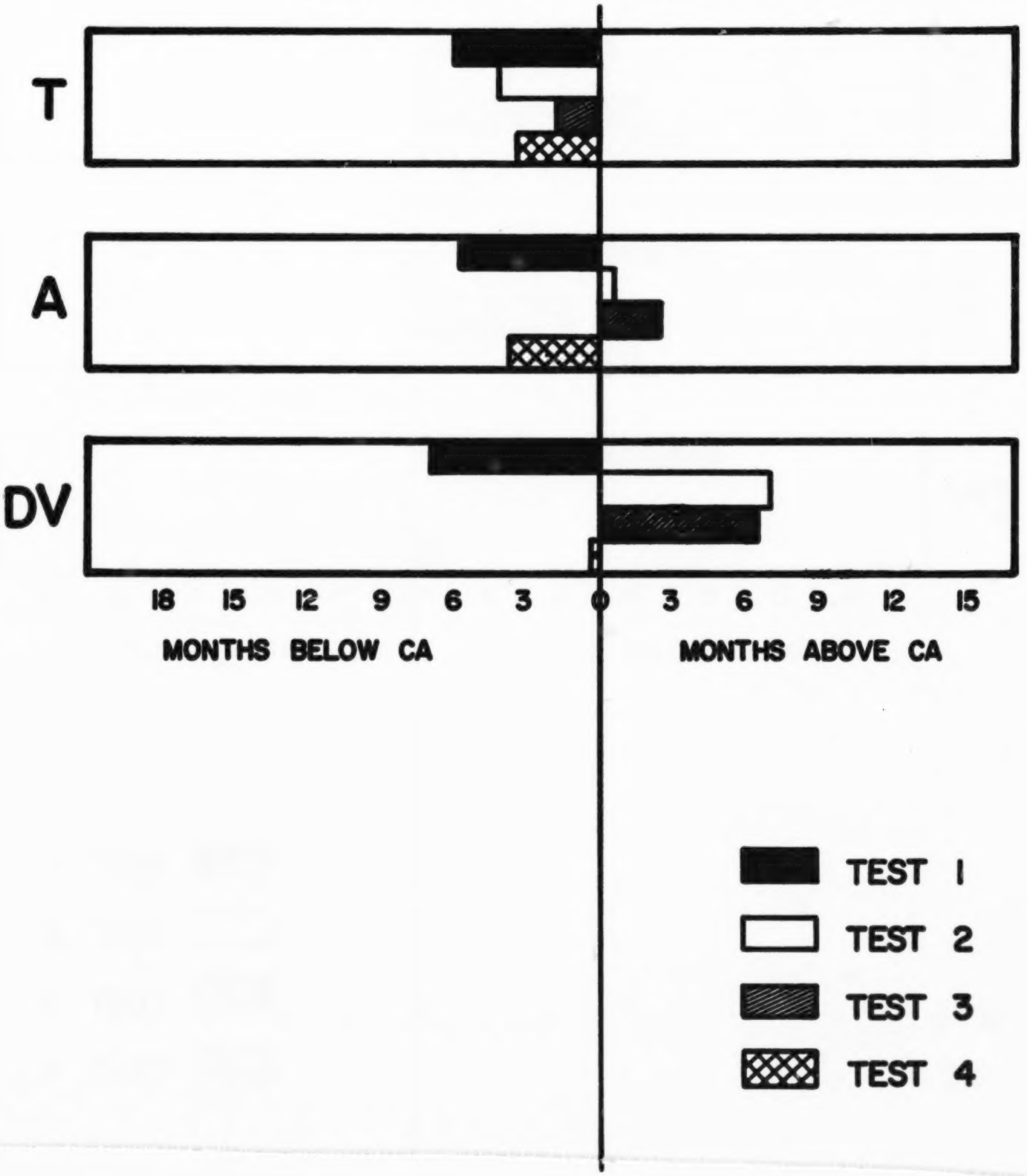


FIGURE 4
AUDITORY-VOCAL ASSOCIATION DIFFERENCE SCORE MEANS
THREE GROUPS FOR THREE YEARS



(less than 2 months) was negligible. During the kindergarten year, the Traditional and Ameliorative groups made modest progress, and the Direct Verbal group maintained its accelerated level. All groups regressed during the first grade, and test-four scores were similar and revealed no major deficits. When children in the Traditional and Ameliorative groups entered public kindergarten and when children in the Direct Verbal group entered first grade, substantial regressions on the three subtests reflecting verbal expressive abilities occurred. In the Ameliorative and Traditional groups the regressions which began in the kindergarten year continued during first grade. Maintaining classroom dynamics which foster direct pupil-teacher interaction (low pupil-teacher ratio) seems to have been crucial to nondeficit performance.

On two ITPA subtests (Motor Encoding and Visual-Motor Sequencing) the three groups tended to show relatively small initial deficits of three to six months. During the preschool year only the Direct Verbal group failed to make progress on the Motor Encoding test, and the magnitude of their test two-deficit (6 months) stands in contrast to the performance of the other two groups (Figure 5). During the kindergarten year the Traditional group remained nondeficit, the Ameliorative group regressed to its initial level, and the Direct Verbal group achieved a nondeficit performance which it maintained during first grade. The Traditional and Ameliorative groups continued to regress, and their test-four deficits were larger than those they had demonstrated initially. On the Visual-Motor Sequencing test[1] the relatively large gain (9 months) of the Traditional and Ameliorative groups during the preschool year contrasts with the static performance of the Direct Verbal children who gained less than one month (Figure 6). During the kindergarten year, the Direct Verbal group again remained relatively unchanged while the Traditional and Ameliorative groups regressed substantially. Each group regressed during the first-grade year to its initial level of deficit.

On four of the ITPA subtests the three groups showed negligible or no initial deficits: Auditory Decoding, Auditory-Vocal Sequencing, Visual-Motor Association, and Visual Decoding. Although the Traditional group eliminated its modest initial deficit on the Auditory Decoding subtest during the preschool year and the Ameliorative group maintained its somewhat accelerated performance, credit must be given to the Direct Verbal program for the remarkable

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[1] The initial level of deficit (5 to 11 months) demonstrated by these groups would place this subtest in the category of major initial deficit; however, in the previous study, "The Effects of Five Preschool Interventions: Evaluations over Two Years," evidence was presented to suggest that Visual-Motor Sequencing was not an area of major deficit for the four-year-old disadvantaged children participating in the total study. (See p. 76.)

FIGURE 5

MOTOR ENCODING DIFFERENCE SCORE MEANS
THREE GROUPS FOR THREE YEARS

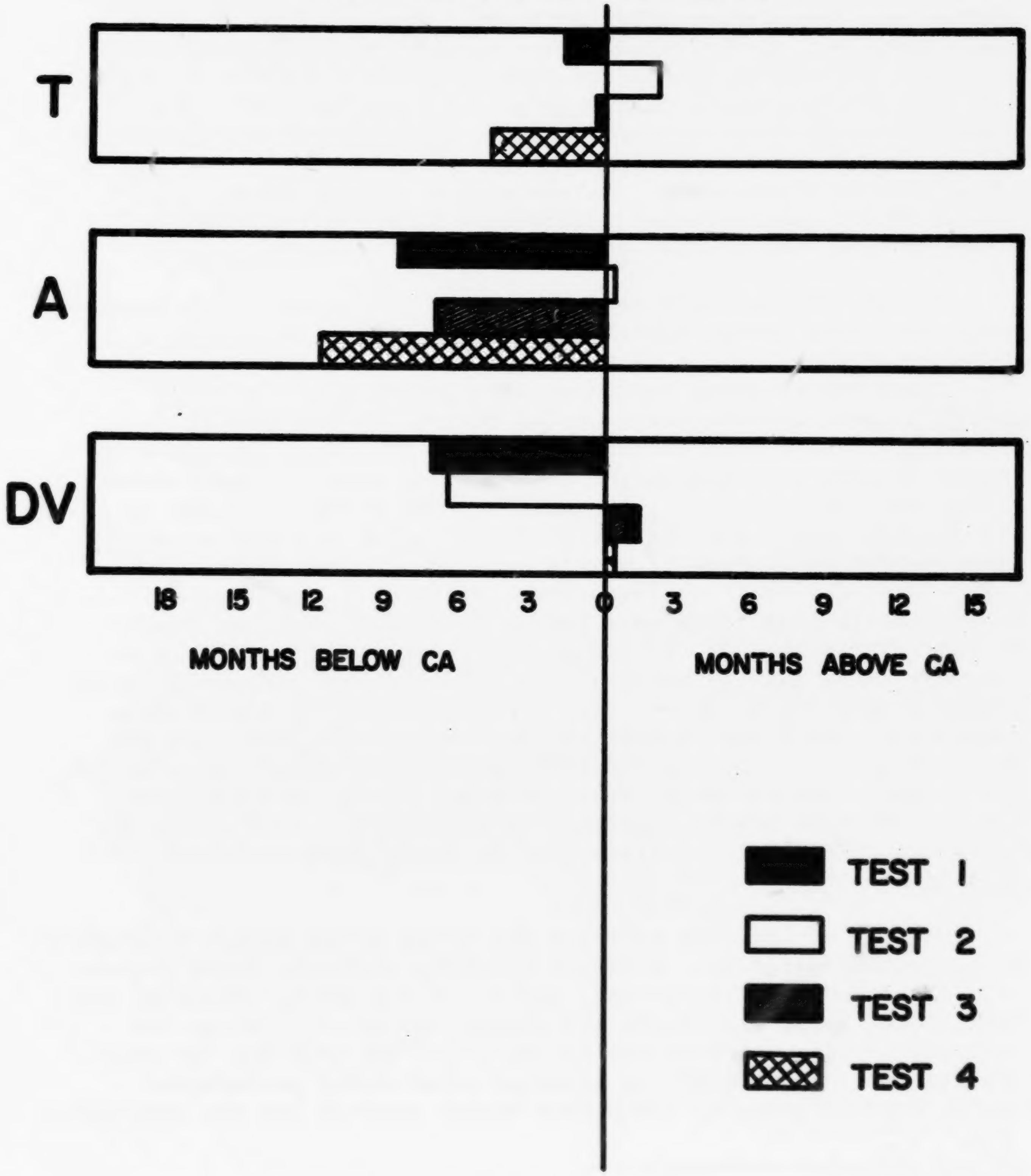
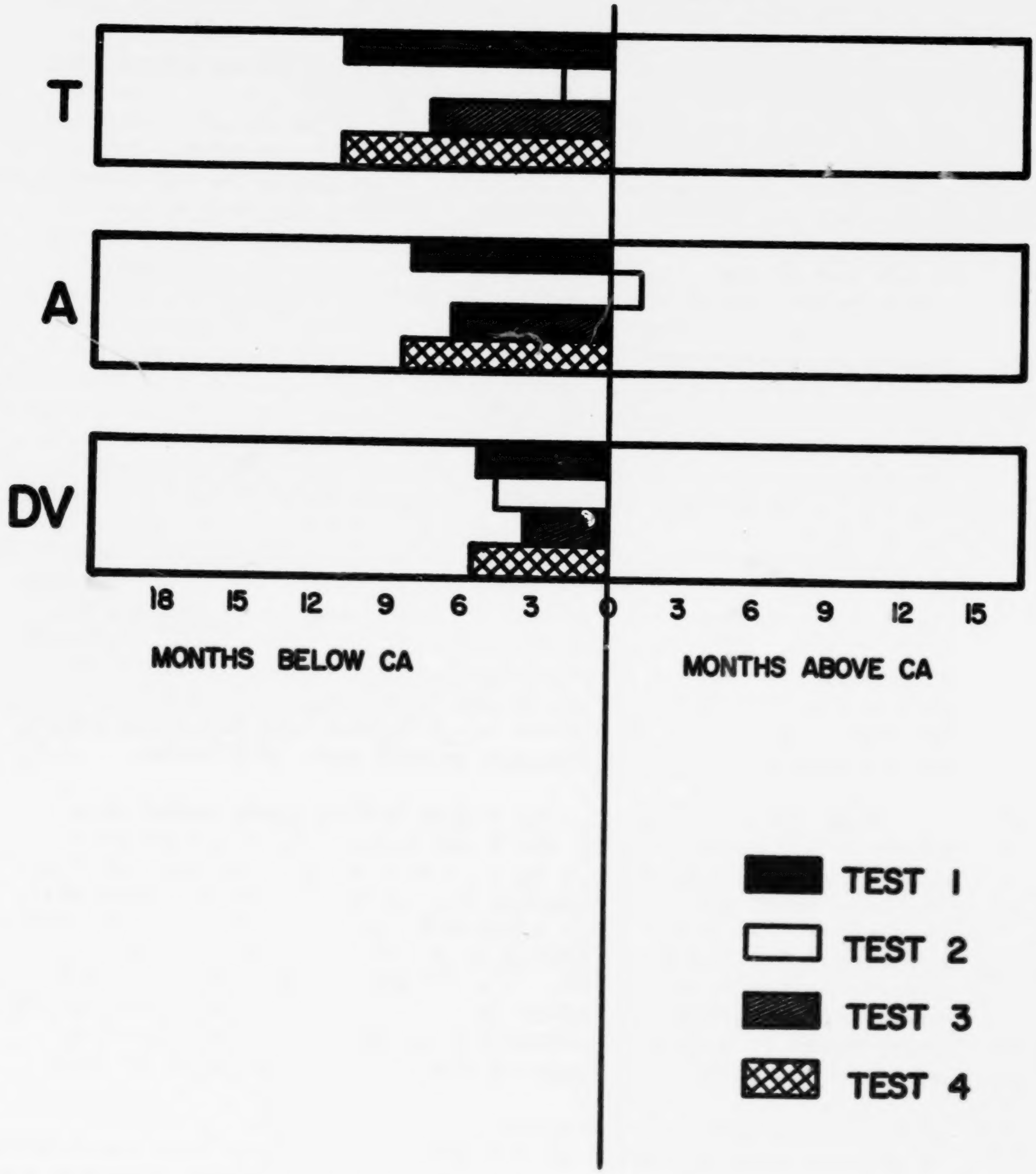


FIGURE 6

VISUAL-MOTOR SEQUENCING DIFFERENCE SCORE MEANS
THREE GROUPS FOR THREE YEARS



progress of the children who gained 8 months in excess of the program interval, scoring 9 months above their mean chronological age at the end of the preschool year (Figure 7). At the end of the kindergarten year, the Ameliorative group remained nondeficit, the Traditional group regressed to approximately its initial level of deficit, and the Direct Verbal group continued to gain, scoring 16 months above its chronological age on test three. At the end of the third year, the Ameliorative and Traditional groups demonstrated further, small regressions while the Direct Verbal group regressed 13 months. These children passed fewer items at the end of first grade than they had at the end of their second year in preschool. Only the Ameliorative group made progress on the Auditory-Vocal Sequencing subtest during the preschool year, and the nondeficit performance of the Traditional and Direct Verbal groups remained unchanged (Figure 8). The Direct Verbal group maintained its nondeficit performance during the second year while the Ameliorative and Traditional groups regressed 5 months. At the end of the first grade, the Direct Verbal group again demonstrated remarkable stability while the Traditional and Ameliorative groups regressed an additional 4 months. No appreciable changes in performance on the Visual-Motor Association subtest occurred during the three years of the study (Figure 9). The small regressions of the Ameliorative group were due to test ceiling effects. All groups did well on the Visual Decoding subtest at the end of the preschool year, but the gain of the Ameliorative group tripled that of either the Direct Verbal or the Traditional group (Figure 10). This gain placed the Ameliorative group eleven months above its chronological age. The Traditional and Direct Verbal groups did not change appreciably during the following two years, maintaining their nondeficit performances at the end of first grade. In sharp contrast, the Ameliorative group regressed 20 months in relation to its chronological age during the two-year period. These children passed 12.6 items on the Visual Decoding test at the completion of preschool and two years later, at the completion of first grade, passed only 13.0 items.

Over the three years, the Direct Verbal group moved in a positive direction on 8 of the 9 subtests. The range of this upward movement was from .4 to 11.5 months, and the gain on four of these eight subtests exceeded 3.1 months.[2] Its one loss was .4 months. The Traditional group made gains on four of the nine subtests. The range was from 2.4 to 3.9 months and in two instances exceeded the median. Its losses ranged from .1 to 9.0 months and exceeded the median in one instance. The Ameliorative group moved in a positive direction on only three of the nine subtests over the three years of the study. The range of this

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[2] A gain or loss in excess of 3.1 months was chosen as a descriptive evaluation point since in half of the instances mean language age difference scores for the three groups were altered to that extent.

FIGURE 7

AUDITORY DECODING DIFFERENCE SCORE MEANS
THREE GROUPS FOR THREE YEARS

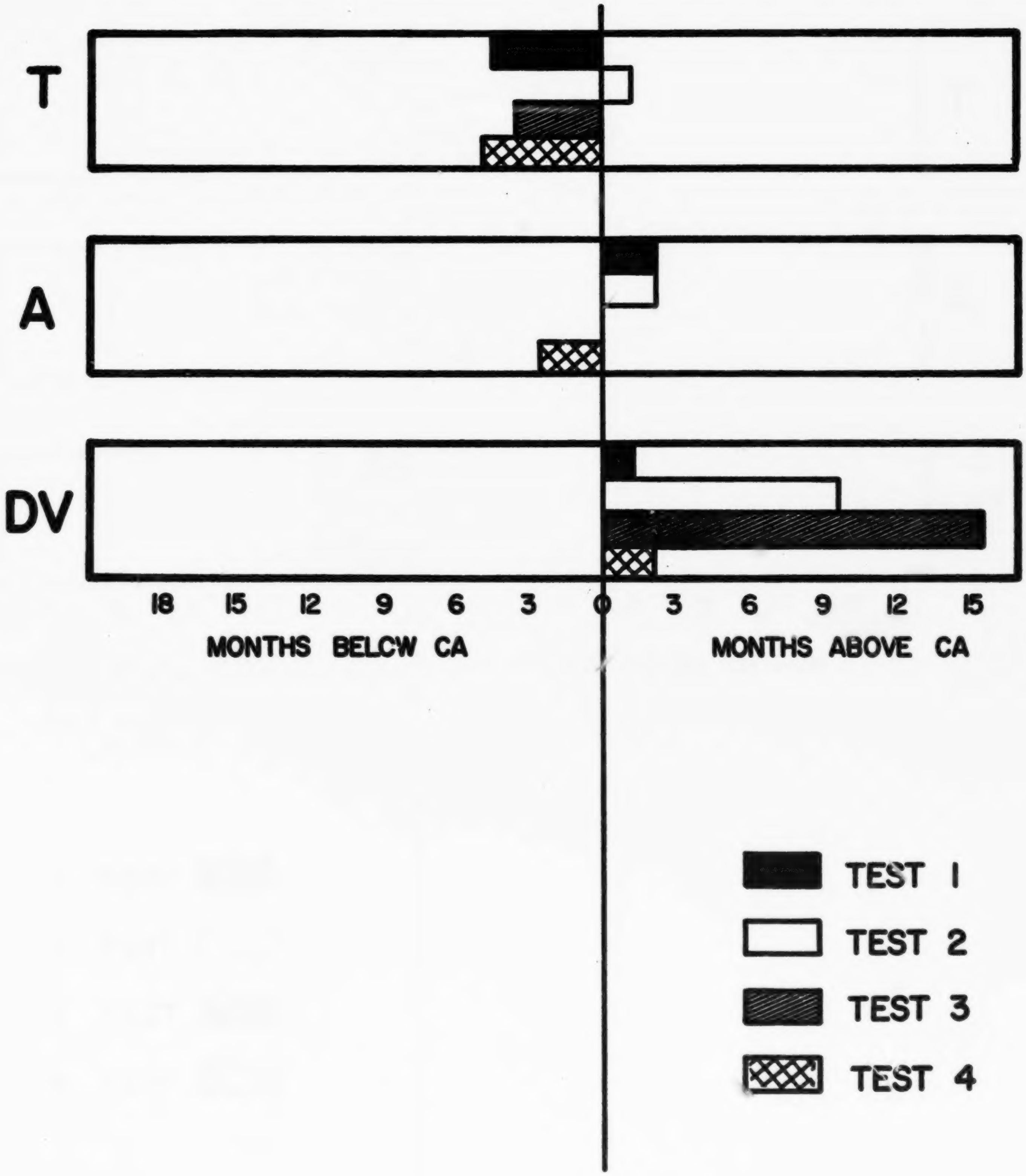


FIGURE 8

AUDITORY-VOCAL SEQUENCING DIFFERENCE SCORE MEANS
THREE GROUPS FOR THREE YEARS

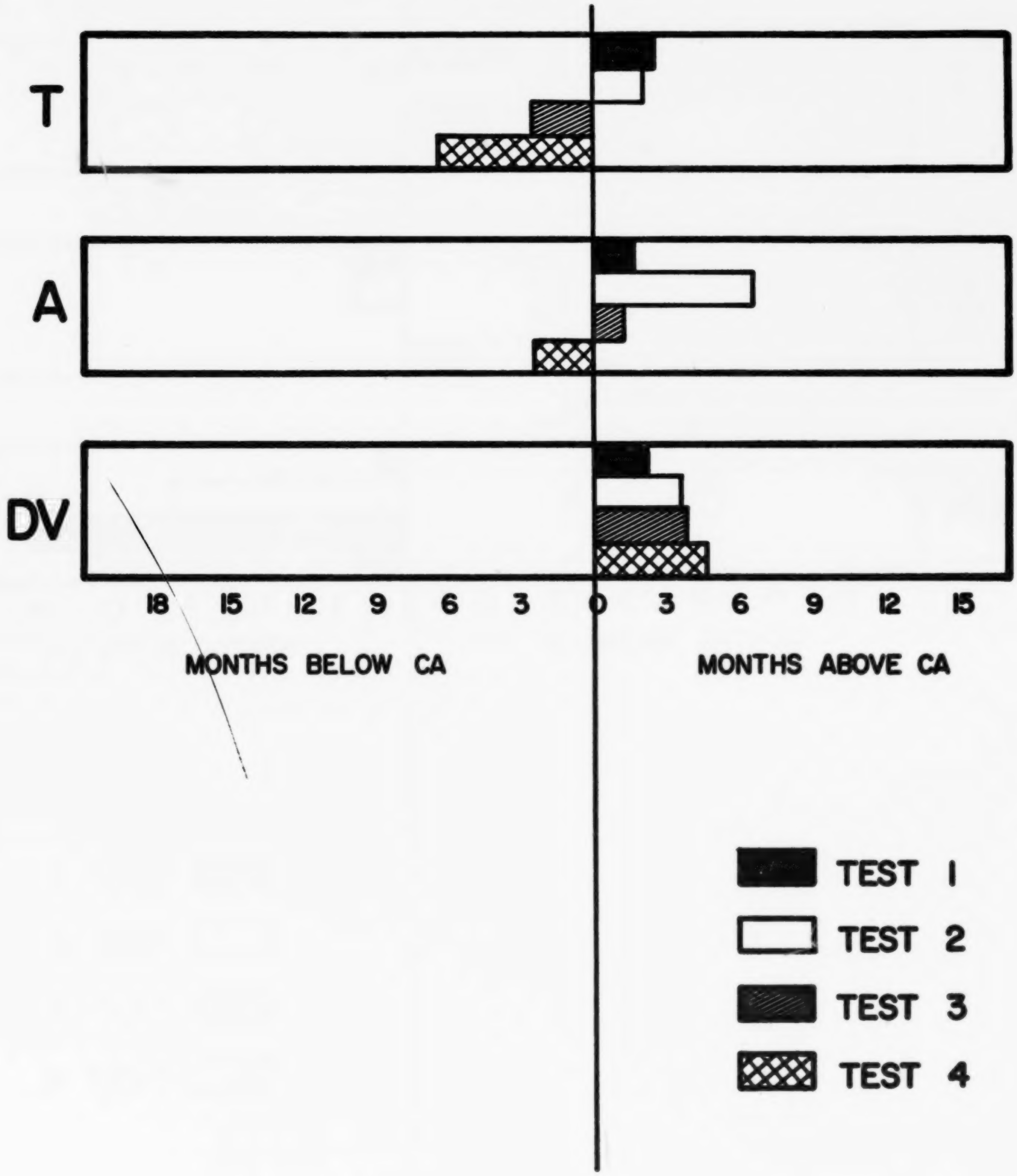


FIGURE 9

VISUAL-MOTOR ASSOCIATION DIFFERENCE SCORE MEANS
THREE GROUPS FOR THREE YEARS

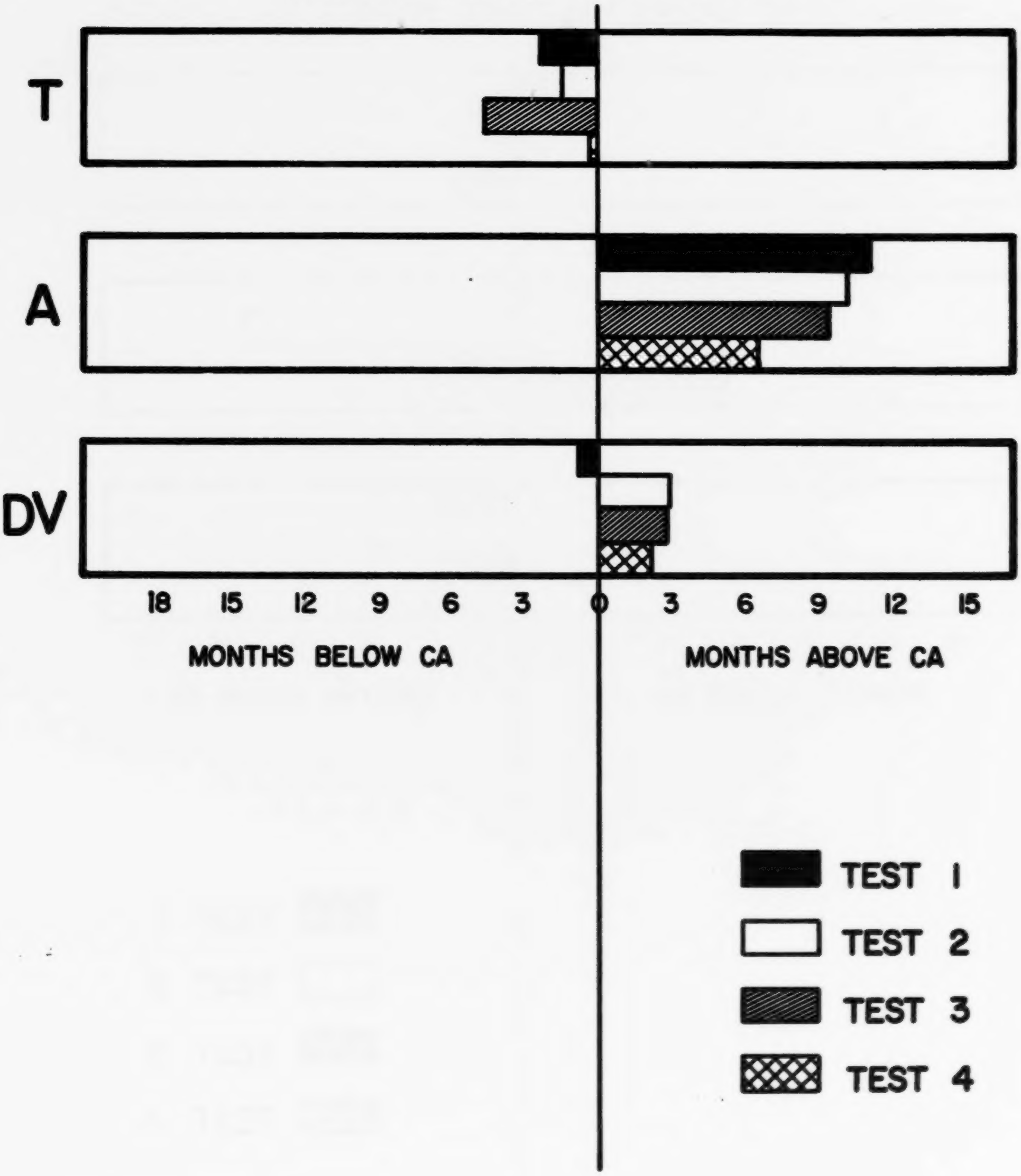
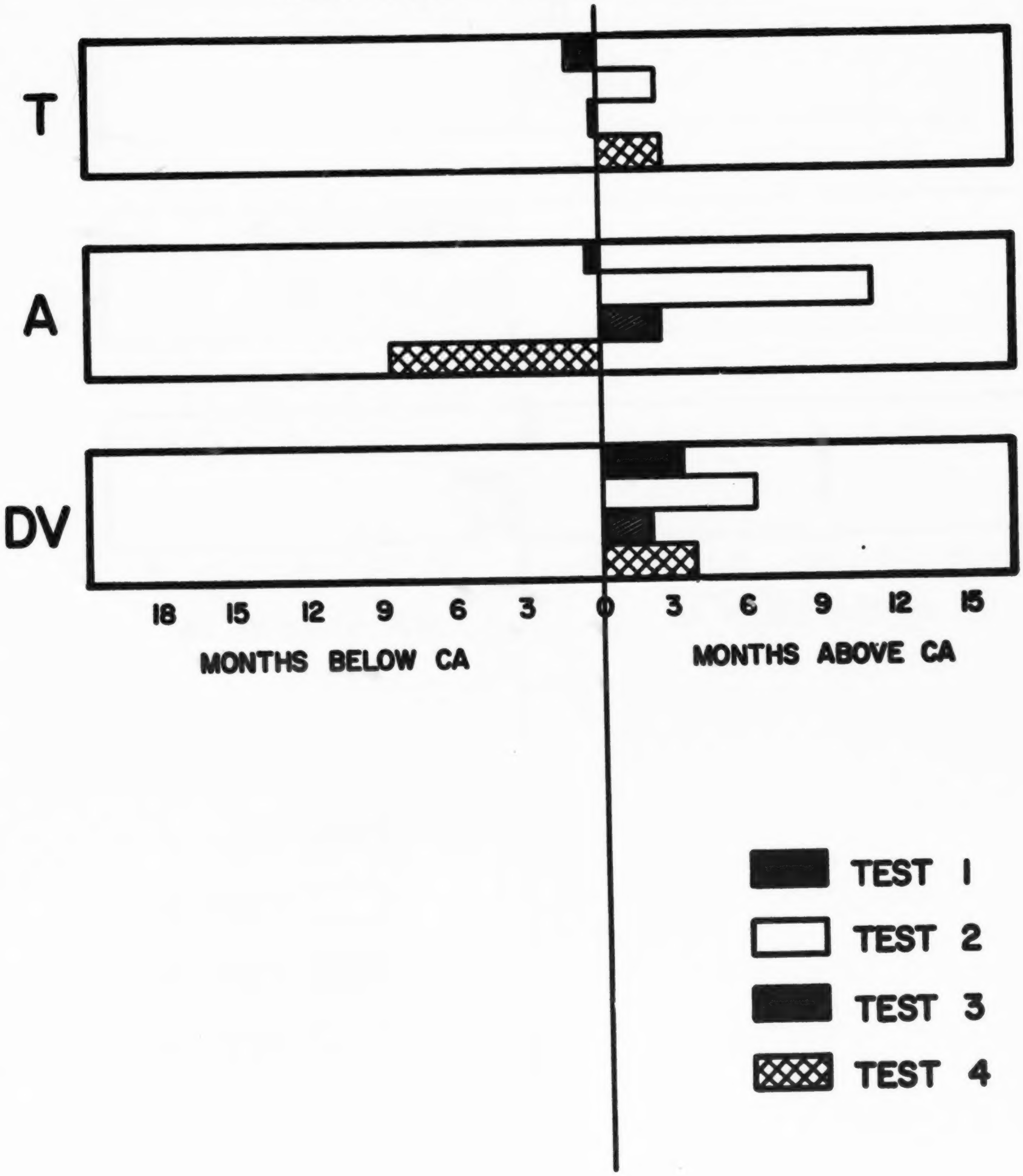


FIGURE 10
VISUAL DECODING DIFFERENCE SCORE MEANS
THREE GROUPS FOR THREE YEARS



upward movement was from 2.3 to 7.5 months, and in one instance exceeded the median. Its losses ranged from .3 to 8.2 months and exceeded the median in five instances. The test-four performance of the Ameliorative group is particularly distressing since its program was intended to ameliorate such language inadequacies and since its nondeficit test-two performance had been so encouraging.

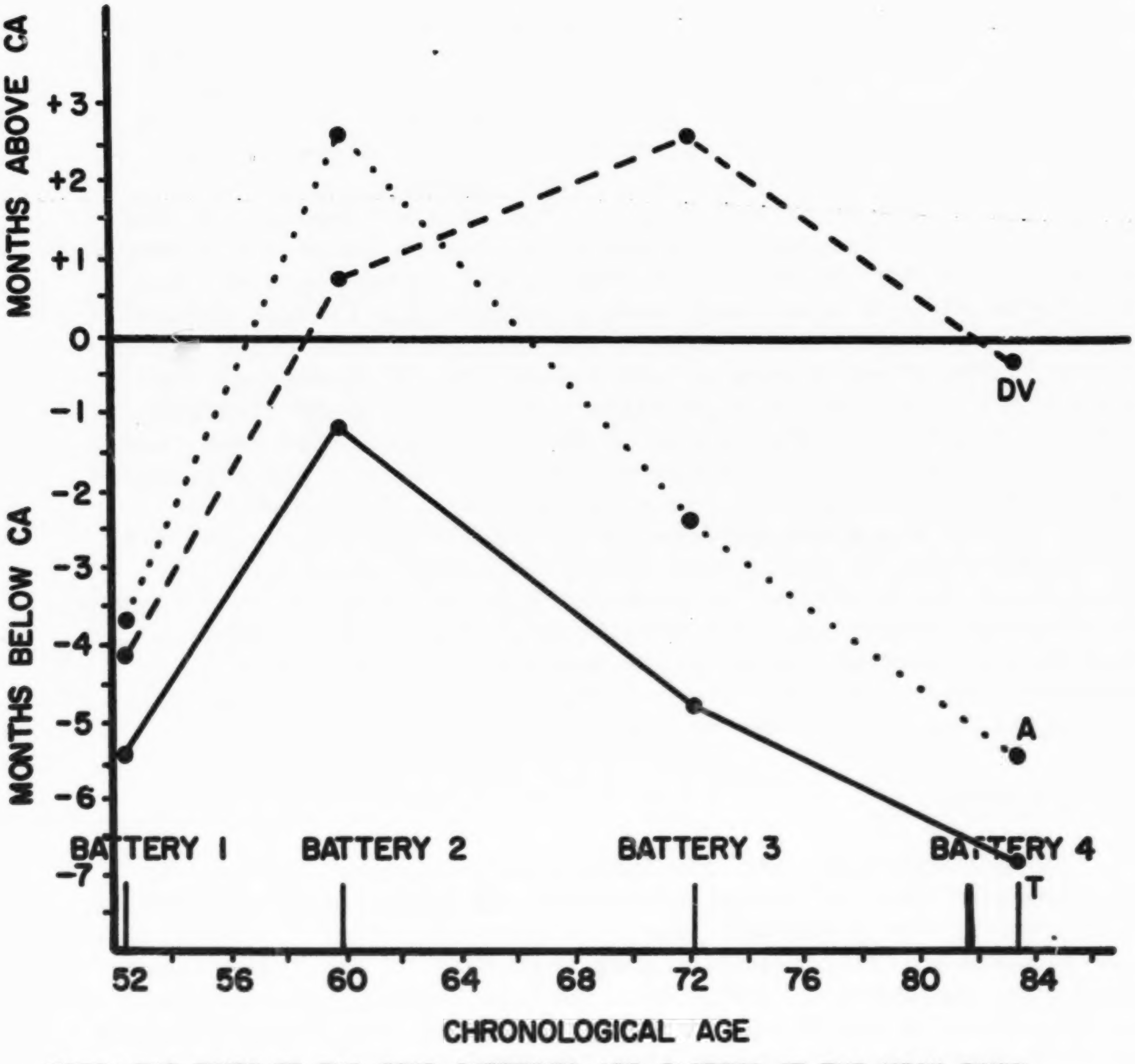
The language performance pattern of the three groups over three years is clearly illustrated by the ITPA total (Figure 11). Initial ITPA total language age deficits were four to five months. At the end of the preschool year, the three groups were performing very nearly at their respective chronological ages. The Traditional group maintained a small deficit, and the Direct Verbal group achieved a modest acceleration. The Ameliorative group made the largest gain and was functioning nearly three months above its mean chronological age. During the second year of the study, only the Direct Verbal group made continued gains, and its ITPA total performance was significantly higher than those of the Ameliorative and the Traditional groups (Appendix D, Table 7). The losses of the Ameliorative group during the kindergarten year resulted in a test-three performance two months below its chronological age while the losses of the Traditional group resulted in a test-three deficit which very nearly equaled its initial deficit. There were no statistical differences among the ITPA total performances of the three groups at the end of the third year of the study (Table 15). All groups regressed during the first-grade year. The extent of the losses of the Traditional and Ameliorative groups during the kindergarten and first-grade years exceeded the gains they had made in the preschool year. Although the Direct Verbal group was performing at its chronological age, the loss experienced by this group during the first grade exceeded its gain of the kindergarten year and does not support an encouraging language prognosis. The longitudinal data suggest that no intervention program was entirely successful in providing the necessary impetus to maintain an adequate level of language functioning in the first grade of the public schools.

Visual Perception

The performances over the three-year period on the Frostig Developmental Test of Visual Perception are presented in Figure 12. At the end of the preschool year, the performance of the Ameliorative group was significantly higher than that of the Traditional group only (Appendix C, Table 4). During the kindergarten year, the Ameliorative and Direct Verbal groups made continuing progress and were significantly higher than the Traditional group which regressed slightly (Appendix D, Table 4). All groups made progress during the first-grade year; however, the Traditional group made a substantial gain and there were no longer significant differences among the groups (Table 16).

FIGURE 11

ITPA TOTAL LANGUAGE AGE DIFFERENCE SCORES
THREE GROUPS FOR THREE YEARS



NOTE: THE TIMES OF THE FOUR BATTERIES ARE PLOTTED AT THE MEAN BINET CHRONOLOGICAL AGE OF THE THREE GROUPS

Table 15

ITPA Total
Mean Language Age Difference Score in Months
Three Groups for Three Years

Group	N	Test 1	diff.	Test 4	Covaried Mean
Traditional	25	-5.4	- .7	-6.1	18.29
Ameliorative	24	-3.7	-1.8	-5.5	16.98
Direct Verbal	10	-4.1	3.8	- .3	22.70

NOTE: Initial Binet IQ, Peabody IQ, Frostig PQ, and ITPA total language age difference score (in months) were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

Table 16

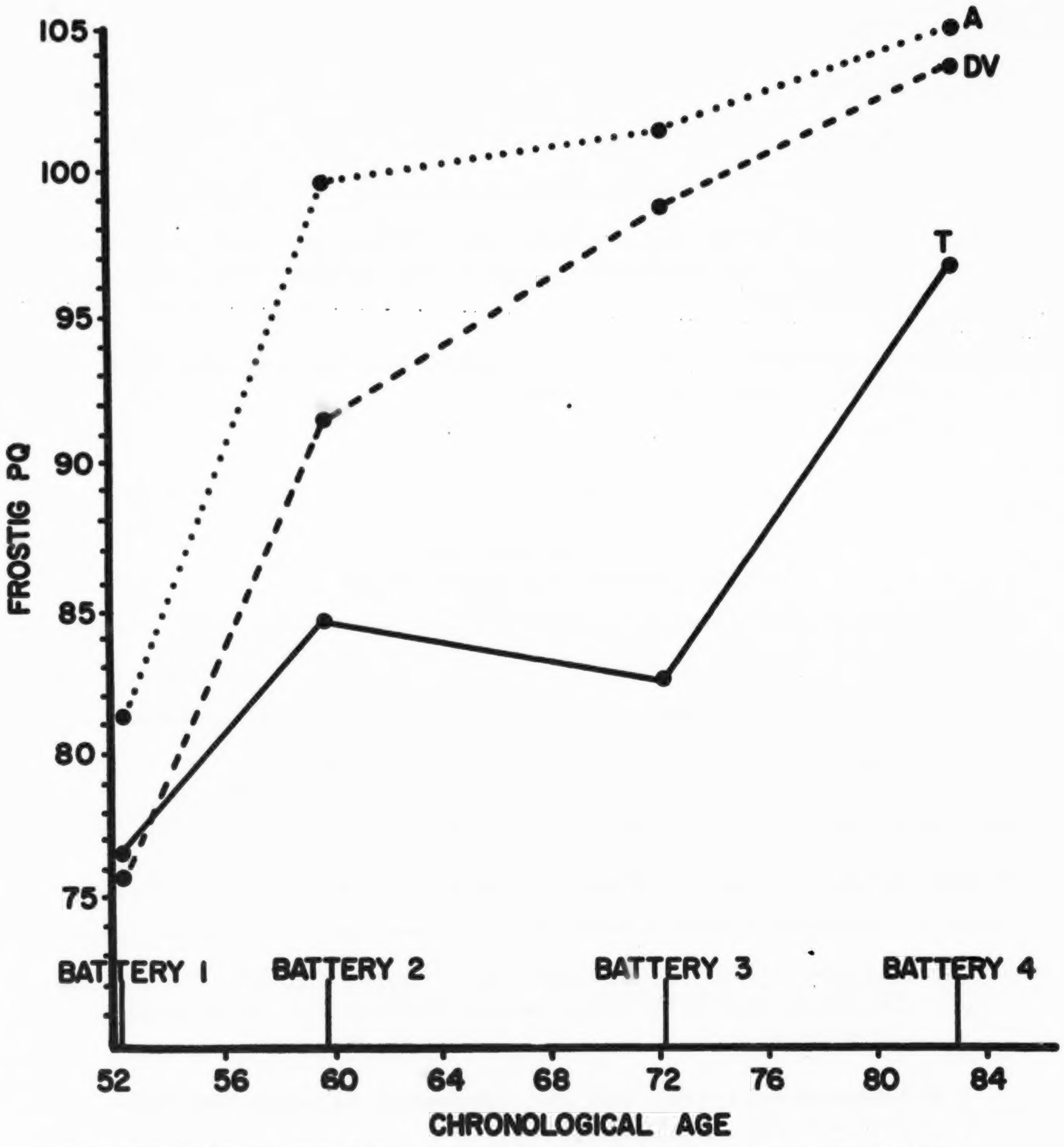
Frostig Mean PQ
Three Groups for Three Years

Group	N	Test 1	diff.	Test 4	Covaried Mean
Traditional	25	76.8	19.8	96.6	4.71
Ameliorative	24	81.1	23.9	105.0	10.69
Direct Verbal	10	75.9	28.0	103.9	11.10

NOTE: Initial Binet IQ, Peabody IQ, Frostig PQ, and ITPA total language age difference score (in months) were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

FIGURE 12
FROSTIG PQ
THREE GROUPS FOR THREE YEARS



NOTE: THE TIMES OF THE FOUR BATTERIES ARE PLOTTED AT THE MEAN BINET CHRONOLOGICAL AGE OF THE THREE GROUPS

Frostig (1964) suggests that children whose scores fall in the lowest quartile (a perceptual quotient of 90 or below) will experience difficulty in school adjustment and recommends remedial training for these children. Initially, nearly all of the children fell in this category (Table 17). At the end of the first year, 76% of the children in the Traditional group, 30% of the children in the Direct Verbal group, and 21% of the children in the Ameliorative group obtained such scores. The percent of children in the Traditional and Direct Verbal groups who obtained scores in the lowest quartile did not change during the second year; in the Ameliorative group this percent decreased to 12. At the end of the third year, only 8% of the children in the Ameliorative group scored in the lowest quartile while 20% of the Direct Verbal children and 48% of the Traditional children earned such scores. Children who participated in the Traditional program did indeed make gains in this area in the first grade; however, the groups which participated in the structured, academically-oriented preschool programs had a considerably smaller percentage of children who might be considered prone to reading failure, to the extent that reading failures are related to visual perceptual inadequacies.

Table 17

Frostig Perceptual Quotient
Children in the Lowest Quartile

		Preschool Year	Kindergarten Year	First Grade	
Group	N	Test 1	Test 2	Test 3	Test 4
T	25	96%	76%	76%	48%
A	24	75%	21%	12%	8%
DV	10	90%	30%	30%	20%

Summary of Results

At the end of the third year of the study, when all children were completing first grade, significant differences among the three groups were found in school achievement. The performances of the Ameliorative and Direct Verbal groups were superior to those of the Traditional group in reading, language, and arithmetic as assessed by the California Achievement Tests. There were no significant differences among the groups in intellectual functioning as measured by the Stanford-Binet, in language development as assessed by the Illinois Test of Psycholinguistic Abilities, or in visual perception as measured by the Frostig test.

CONCLUSIONS AT THE END OF FIRST GRADE

No intervention program was entirely successful in providing the impetus necessary to sustain at the end of first grade the gains in intellectual functioning and language development made during the preschool years. In spite of the disappointments of some of the longitudinal data, however, a major accomplishment of this study remains: Serious learning deficits of the disadvantaged children in the Ameliorative and Direct Verbal groups were eliminated during the preschool year. In the Direct Verbal program, where an extensive intervention was sustained over a two-year period, continued growth occurred. The deterioration in language and intellectual functioning which occurred at the termination of intensive programming demonstrates the need for continued intervention characterized by low pupil-teacher ratios which make possible the interaction necessary for language development and which provide the opportunity to design and implement learning experiences to achieve specific goals.

Although these three short-term interventions (even a two-year classroom intervention is essentially a short-term effort) did not differentially alter intellectual functioning in any permanent fashion, two aspects of the Binet data have important implications. The sizeable gain of the low strata children in the Ameliorative classes remained stable throughout the three years of the study (Table 13), most pertinently, during first grade when no research intervention was provided for a full year. It seems justifiable to conclude that the Ameliorative program offered particular opportunities to develop the intellectual functioning of low-normal and slow-learning children. The Ameliorative preschool stressed physical mastery of a concept through manipulative experiences accompanied by appropriate verbalizations -- a mode of instruction apparently suited to children in this stratum. The supportive program the following year maintained this gain and seemed to provide the necessary thrust to sustain this level of performance in the third year with no special programming. Since the early amelioration of school inadequacies was the intent of the Ameliorative program, the magnitude and stability of the IQ gain of the low ability children is encouraging.[3]

The IQ losses experienced by the high strata children in both the Traditional and Ameliorative groups during the first grade are of real concern and resulted in an IQ change in a negative direction over the three-year period. (Again, it is difficult to include the performance of the Direct Verbal stratum in this discussion since only three children were involved.) The modest gain of the Traditional high stratum and the substantial gain of the Ameliorative high stratum during the preschool year remained constant through the kindergarten year but were lost during the first grade (Table 13). It seems untenable to presume a factor common to these two-year interventions which explains such losses. Rather, it seems reasonable to assume that in important ways the public schools during first grade failed disadvantaged children with demonstrated potential. This assumption is further supported by the fact that 24 of the 26 children from the three intervention groups who scored 110 and above at the end of the kindergarten year scored lower on the Stanford-Binet at test four than they had on test three (a mean loss of 9 IQ points).

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[3] The children in the low stratum of the Direct Verbal group made a 19 point IQ gain over the three years; however, considerations of gains by strata for this group must remain tentative since the low stratum is composed of only three children and since these children lost 12 points of their two-year gain during the first-grade year. When the second Direct Verbal class unit completes first grade, more reliable observations can be made.

Since the intent of preschool intervention for disadvantaged children is to alter in positive ways later school performance, both structured programs must be judged successful. Although important interim evaluations were made, school achievement at the end of first grade was understood to be an essential criterion in program evaluation. Differences among groups in ability (intellectual functioning, language development, visual perception) no longer existed at the end of first grade, and differences in achievement must relate to the effectiveness with which groups of children used very similar abilities. Structure in the Direct Verbal and Ameliorative programs, implemented through two very different strategies, required the active involvement of teacher and child. Such activity oriented the disadvantaged child at an early age to participate effectively in highly specific learning situations and to operate in ways which made possible maximum benefits from first-grade instruction. In spite of two years of traditional preschool programming, nearly half of the children in the Traditional group obtained California scores which indicated sharply limited school achievement. Virtually all of the children in the two structured programs were making at least adequate academic progress (Tables 5 and 8). The differential achievement level demonstrates the potential for school success among disadvantaged children which can be developed through structured preschool experiences. Functioning effectively in the public school setting is a critical first step in altering the life circumstances of the disadvantaged child to the end that he may participate more fully in the educational and economic opportunities of a democratic culture.

THE AMELIORATIVE PROGRAM WITH CHILD AND STAFF VARIABLES

Earlier Intervention: Effects of the Ameliorative Program Initiated with Three-Year-Old Children and Maintained for Two Years

Merle B. Karnes, Audrey S. Hodgins
and James A. Teska

The years immediately following infancy, J. McVicker Hunt (1964) has maintained, are those when an adverse environment is most likely to inhibit language development and to prevent optimal intellectual functioning. It seems plausible, therefore, that preschool intervention for disadvantaged children should begin even before the presently accepted age of four. David Weikart (1967) has come to similar conclusions and suggested in a recent survey of current preschool programs that intervention before the age of four and the development of structured programs which emphasize cognitive and language development are necessary to achieve accelerated child growth. This study, based on similar assumptions, was concerned with the effects of the Ameliorative program when initiated with three-year-old disadvantaged children and maintained over a two-year period. The progress of the three-year-old children after one year in the Ameliorative program was compared to that of the four-year-old children who had been enrolled in the previous Ameliorative program.[1] At the end of the second year of the study, the progress of the children who participated in the Ameliorative program for two years (as three-year-olds and as four-year-olds) was again compared to that of the children who had participated in the Ameliorative program for only one year (as four-year-olds).

METHODOLOGY

Recruitment procedures were the same as those employed in the earlier studies (p. 59), except that the children were three years old before the first of December, an age appropriate for enrollment in the public kindergarten in two years. Race and sex ratios and the three intelligence strata class design were maintained (Table 1).

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[1] A comparison of the progress of the three-year-old children after one year in the Ameliorative program with that of a control group of three-year-old children who received no educational intervention appears in Karnes, Hodgins, Stoneburner, Studley, and Teska (1968).

Table 1

Initial Group Composition

Age of Initiation of Ameliorative Program	N*	Mean Binet CA	Mean Binet IQ	Intelligence Strata Means						Race		Sex	
				High	N	Middle	N	Low	N	Caucasian	Negro	M	F
3 Years	15	37.9	94.7	106.2	4	94.6	7	83.2	4	5	10	7	8
4 Years	27	51.9	96.0	107.2	9	95.1	10	84.4	8	9	18	13	14

*Four children withdrew from the program during the first year, and no data for these children are included in this study.

Since the Ameliorative program had been developed as a one-year intervention for four-year-old children, a number of accommodations were necessary to use this program with three-year-olds over a two-year period. During the first year, material was presented at a slower rate and concepts were introduced at their simplest levels. More time was required to develop basic labeling vocabulary on which associative and classifying skills could later be built. Fine motor activities received greater attention. Fewer units of work were introduced in the three curricular areas, particularly in mathematics, so that more time could be spent developing the concrete mathematical operations of sorting, matching, and ordering. During the second year, units of work not taught the first year were covered and new units were added, particularly in the social studies-science curriculum. Although the basic Ameliorative program was repeated, units which had been taught at a minimal level the first year were expanded the second year beyond the level reached by other Ameliorative classes for four-year-olds. The teacher-pupil ratio (1:5) and the daily schedule of the previous Ameliorative program were maintained over the two years. (See pp. 52-55.)

RESULTS AFTER ONE YEAR

Statistical treatment of the Binet, Peabody, Frostig, and ITPA total data employed a multivariate analysis of covariance using initial Binet, Peabody, and ITPA total scores as covariates. Since the Frostig was not included in the pre-battery for three-year-old children, these data were not available for use as a covariate. The F ratio for the multivariate test of equality of mean vectors on these four instruments revealed no significant differences between the progress made by the three-year-old children during one year in the Ameliorative program and that made by four-year-old children in one year (Table 2). Both raw and covaried means indicate a remarkable similarity between these ratio scores of the two groups.

A separate analysis of covariance was conducted on the ITPA subtest data, using initial scores from the nine subtests as covariates. The F ratio for the multivariate test of equality of mean vectors was significant (Table 3). An examination of the univariate F's revealed significant differences below the .05 level on three subtests. On two of these subtests (Auditory-Vocal Automatic and Motor Encoding) both groups had sizeable and comparable initial deficits, and in both instances the progress made by the four-year-old children in one year was clearly superior and resulted in a nondeficit performance. The three-year-old children made no appreciable progress on these two subtests during the first year of the Ameliorative program, and it seems reasonable to conclude that these aspects of language development were not amenable to amelioration at the age of three. The third

Table 2

Multivariate Analysis of Covariance for the Total Battery at the End of One Year

F ratio for multivariate test of equality of mean vectors = 2.1292
df = 4 and 34
P less than .0986

Variable	Age of Initiation of Ameliorative Program	N	Pre-Test Mean	diff.	Mean After One Year	Covaried Mean	Between Mean Sq.	Univariate F	P less than
Binet IQ	3 years	15	94.7	16.7	111.4	25.79	111.8019	2.9235	.0957
	4 years	27	96.0	14.3	110.3	22.09			
Peabody IQ	3 years	15	72.7	11.2	83.9	38.00	503.0145	2.7214	.1075
	4 years	27	85.9	10.2	96.1	45.86			
Frostig PQ	3 years	15			88.0	30.54	446.6140	3.3628	.0748
	4 years	27			99.1	37.94			
ITPA Total Lang. Age Difference Score	3 years	15	-5.3	6.9	1.6	44.60	6.4719	.3204	.5748
	4 years	27	-3.3	6.3	3.0	43.71			

NOTE: Initial Binet IQ, Peabody IQ, and ITPA total language age difference scores (in months) were used as covariates. To relate language age to chronological age, a difference score was computed by subtracting a child's chronological age at the time of testing from his language age score.

Table 3

Multivariate Analysis of Covariance for the Nine ITPA Subtests at the End of One Year

F ratio for multivariate test of equality of mean vectors = 4.0166
df = 9 and 23 P less than .0034

Variable	Age of Initiation of Ameliorative Program	N	Pre-Test Mean	diff.	Mean After One Year	Covaried Mean	Between Mean Sq.	Univariate F	P less than
Auditory-Vocal Automatic	3 years	15	- 8.1	- .5	- 8.6	- 9.14	853.3294	5.4956	.0257
	4 years	27	-10.8	10.8	0.0	3.84			
Visual Decoding	3 years	15	- 2.8	5.3	2.5	- 6.64	508.4380	3.3048	.0788
	4 years	27	- .2	12.1	11.9	3.37			
Motor Encoding	3 years	15	- 5.9	.8	- 5.1	60.00	972.5763	5.6144	.0243
	4 years	27	- 6.6	6.8	.2	73.85			
Auditory-Vocal Association	3 years	15	- 8.1	6.7	- 1.4	2.49	11.2923	.2354	.6310
	4 years	27	- 5.4	6.8	1.4	3.99			
Visual-Motor Sequencing	3 years	15	2.6	4.2	6.8	69.64	105.9654	1.5151	.2277
	4 years	27	- 6.4	7.9	1.5	65.07			
Vocal Encoding	3 years	15	- 8.4	9.0	.6	44.75	13.6274	.1034	.7500
	4 years	27	-13.6	11.3	- 2.3	43.11			
Auditory-Vocal Sequencing	3 years	15	- 1.4	2.4	1.0	1.08	110.2467	1.1393	.2941
	4 years	27	.9	5.3	6.2	5.74			
Visual-Motor Association	3 years	15	- 4.1	12.6	8.5	77.18	670.8057	4.7079	.0379
	4 years	27	9.9	.8	10.7	88.69			
Auditory Decoding	3 years	15	- 4.2	10.5	6.3	25.47	326.6578	3.9479	.0559
	4 years	27	1.9	.6	2.5	17.44			

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

significant difference in favor of the four-year-old children was obtained on the Visual-Motor Association subtest. An examination of the means reveals that the higher final score of the four-year-old group is merely a reflection of its atypically high initial score rather than an indication of progress, and in spite of the very substantial gain (13 months in excess of the program interval) made by the three-year-old children in one year, they did not reach the level of the four-year-old children.

POST-INTERVENTION RESULTS

The analysis of covariance for the total battery at the end of the intervention employed the same covariates used in the first year's analysis (Binet, Peabody, and ITPA total scores). Peabody data were not available at the end of the second year for the early intervention group because this instrument had been eliminated from the evaluation battery. The F ratio for the multivariate test of equality of mean vectors indicated no significant difference between the two groups on this battery (Table 4). The progress made in two years by children who began the Ameliorative program at the age of three was not superior to that made in one year by children who began the program at the age of four. Doubling the length of intervention with apparently appropriate program accommodations had no appreciable impact, and, in fact, a five point Binet IQ regression occurred during the second year. The performances of the two groups on the ITPA total and the Metropolitan Readiness Tests were nearly identical, and only on the Frostig Developmental Test of Visual Perception did the early intervention group continue to make accelerated progress during the second year. Their Frostig scores at the end of the second year, however, did not reflect greater gains than those made by the four-year-old children in one year.

The F ratio for the multivariate test of equality of mean vectors revealed no significant difference between the two groups on the nine ITPA subtests on this battery (Table 5). A discussion of subtest interactions on this basis is not warranted; however, atypical performances on two subtests (Auditory-Vocal Automatic and Vocal Encoding) merit comment, particulary since these subtests represent two of the three critical areas of language deficit for disadvantaged preschool children. During their first year, the children in the early intervention group made no gain on the Auditory-Vocal Automatic subtest and remained substantially deficit on this subtest. A deteriorating performance during the second year of the program increased the magnitude of this deficit to twelve months below their chronological age. This regressive performance is disconcerting because verbal abilities represent a crucial area and is difficult to understand in light of the exceptionally high Vocal Encoding scores earned by this same group. At the end of one year of intervention, the deficit in Vocal Encoding of the three-year-old children had been eliminated,

Table 4

Multivariate Analysis of Covariance for the Total Battery at the Post-Intervention Testing

(Two-Year Intervention for Three-Year-Olds and One-Year Intervention for Four-Year-Olds)

F ratio for multivariate test of equality of mean vectors = .5787
df = 5 and 31 P less than .7159

Variable	Age of Initiation of Ameliorative Program	N	Pre-Test Mean	diff.	Post-Intervention Mean	Covaried Mean	Between Mean Sq.	Univariate F	P less than
Binet IQ	3 years	13*	94.8	12.0	106.8	14.00	7.3030	.1941	.6623
	4 years	27	96.0	14.3	110.3	14.98			
Peabody IQ	3 years	13	73.9						
	4 years	27	85.9						
Frostig PQ	3 years	13			99.1	36.47	95.4150	.7531	.3914
	4 years	27			99.1	32.95			
ITPA Total Language Age Difference Score	3 years	13	-5.0	6.5	1.5	46.44	.3791	.0237	.8785
	4 years	27	-3.3	6.3	3.0	46.22			
Metropolitan Reading Raw Score	3 years	13			38.4	-19.30	18.5940	.4982	.4850
	4 years	27			40.7	-20.86			
Metropolitan Number Raw Score	3 years	13			8.8	-11.60	8.4269	.7141	.4039
	4 years	27			10.7	-10.55			

NOTE: Initial Binet IQ, Peabody IQ, and ITPA total language age difference scores (in months) were used as covariates.

*Two children withdrew before the end of the second year, and no data for these children are included in the post-intervention analysis.

Table 5

Multivariate Analysis of Covariance for the Nine ITPA Subtests
at the Post-Intervention Testing

(Two-Year Intervention for Three-Year-Olds and One-Year Intervention for Four-Year-Olds)

F ratio for multivariate test of equality of mean vectors = 1.3333
df = 9 and 21 P less than .2789

Variable	Age of Initiation of Ameliorative Program	N	Pre-Test Mean	diff.	Post-Intervention Mean	Covaried Mean	Between Mean Sq.	Univariate F	P less than
Auditory-Vocal Automatic	3 years	13*	- 8.3	-3.5	-11.8	- 5.93	1179.0691	7.2496	.0117
	4 years	27	-10.8	10.8	0.0	10.06			
Visual Decoding	3 years	13	- 3.4	11.2	7.8	-22.71	114.4113	.5662	.4579
	4 years	27	- .2	12.1	11.9	-17.73			
Motor Encoding	3 years	13	- 5.4	2.2	- 3.2	43.59	568.3051	2.4246	.1303
	4 years	27	- 6.6	6.8	.2	54.69			
Auditory-Vocal Association	3 years	13	- 7.8	9.1	1.3	- 6.29	4.5196	.0896	.7669
	4 years	27	- 5.4	6.8	1.4	- 5.30			
Visual-Motor Sequencing	3 years	13	4.3	-2.3	2.0	66.13	.1137	.0021	.9642
	4 years	27	- 6.4	7.9	1.5	65.97			
Vocal Encoding	3 years	13	- 8.6	14.4	5.8	57.44	132.2881	.8995	.3508
	4 years	27	-13.6	11.3	- 2.3	52.08			
Auditory-Vocal Sequencing	3 years	13	- 1.3	6.0	4.7	22.28	42.0399	.2692	.6079
	4 years	27	.9	5.3	6.2	25.30			
Visual-Motor Association	3 years	13	- 4.7	16.2	11.5	67.08	233.4922	1.3943	.2473
	4 years	27	9.9	.8	10.7	74.20			
Auditory Decoding	3 years	13	- 3.2	2.6	- .6	27.33	1.0134	.0265	.8720
	4 years	27	1.9	.6	2.5	27.80			

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

*Two children withdrew before the end of the second year, and no data for these children are included in the post-intervention analysis.

and three- and four-year-olds did equally well in relation to their respective chronological ages. During its second year in the Ameliorative program, however, the early intervention group again made a substantial gain (5 months) and attained the highest mean Vocal Encoding score of any group at any time in the larger research project.

At the end of the second year of the study neither analysis supported the premise that earlier intervention would enhance the performance of children in the Ameliorative program. The progress of children who participated in the program for two years (as three-year-olds and as four-year-olds) did not differ significantly from that made by children who had participated in the program for only one year (as four-year-olds).

DISCUSSION

The results at the end of the first year of the study generally endorsed the earlier initiation of the Ameliorative program. The first-year gains of the younger group essentially matched the remarkable gains made previously by the four-year-old children in the Ameliorative program. After one year of intervention only one three-year-old child had a Binet IQ (95) below 105. On seven of the nine ITPA subtests this group was performing at or above its chronological age; on three of these seven this group was performing substantially (6 to 8 months) above its chronological age. Apparently the Ameliorative program as accommodated for three-year-old children was appropriate and highly effective.

This acceleration did not continue during the second year, but the gains made during the first year were essentially maintained. The acceleration achieved in one year represented a movement from deficit to nondeficit levels of functioning, and it may have been unrealistic to assume that such acceleration could be continued. Maintaining an essentially nondeficit performance may in itself represent a major achievement, particularly in view of the tendency of disadvantaged children in this and other projects to fail to maintain very promising first-year gains. The accelerated rate of growth achieved during the first year and the demonstrated stability of these gains the second year suggest an optimistic school prognosis for these children.

The Effects of Short-Term Instruction at Home by Mothers of Children not Enrolled in a Preschool[1]

Merle B. Karnes, Audrey S. Hodgins,
and James A. Teska

Preschool programs are recognized as one effective approach for helping disadvantaged children compensate for a lack of early experiences appropriate to later academic achievement, but such programs cannot alter the learning environment at home. Since the particular cognitive style of the low-income, low-educational level family (Ausubel, 1966; Deutsch, 1963; Hunt, 1964; Riessman, 1962) may be perpetuated from generation to generation, parental involvement in the child's early learning is crucial. Programs which have moved in this direction have generally provided parents with information regarding child-rearing practices, child development, and school readiness (Kirk, 1958; Brazziel and Terrell, 1962; Crow, Murry, and Smythe, 1966; Fusco, 1964; Liddle, 1963; Weikart, Kamii, and Radin, 1966). Typically these programs were developed as an integral part of an overall preschool program, and, therefore, it has been difficult to determine the discrete impact of programmed parental intervention on specific aspects of child development.

This study was designed to isolate the effects of short-term, at-home instruction by mothers on the intellectual and language development of their children. Neither experimental nor control children were enrolled in a preschool, and only the mothers of the experimental children were enrolled in a twelve-week training program designed to help them make instructional materials and to learn to use these materials to teach their children at home. It was hypothesized that preschool children of mothers in the training program would demonstrate gains in intellectual functioning and language development significantly greater than those shown by children whose mothers were not involved in a training program. Instruments used for pre- and post-evaluation were the Stanford-Binet Individual Intelligence Scale (1960 edition) and the Illinois Test of Psycholinguistic Abilities (experimental edition, 1961).

METHOD

Subjects

Subjects were selected from families who lived in an economically depressed area and had been referred by the principal of the neighborhood elementary school. All families were known to the principal and judged by her to be among the most economically and educationally deprived. All participants were Negro because the school used as a basis for recruitment had only one Caucasian pupil. Children were to be four years old before December first. Current attendance at a preschool disqualified a child.

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[1] Portions of this report first appeared in Karnes, Studley, Wright, and Hodgins (1968).

The Stanford-Binet Individual Intelligence Scale and the Illinois Test of Psycholinguistic Abilities were administered to these children by school psychologists in classrooms unfamiliar to all children. After the initial test battery, a control and an experimental group (N=15) were established with comparable mean intelligence quotients and sex ratios (Table 1).

Table 1

Initial Group Composition

Group	N*	Mean Binet CA	Mean Binet IQ	Sex	
				Male	Female
Experimental	12	45.8	90.8	7	5
Control	12	45.3	96.0	8	4

*Six children withdrew or were eliminated from the study before the posttest because they enrolled in preschool, moved from the community, or had inaccurately recorded birthdates and were, therefore, ineligible for the study. No data for these children are included in this report.

Intervention

The mothers of the experimental children attended eleven weekly two-hour meetings at the neighborhood elementary school. (In one case, a grandmother responsible for the child's care participated.) Three experienced preschool teachers conducted the meetings, and each teacher worked closely with a group of five mothers. As part of the project staff, mothers were paid $3.00 a session but received no remuneration for the time spent working with their children at home. The teachers encouraged the mothers to feel that they were an important part of an educational team and stressed the immediate benefits to the participating children as well as the potential benefits to other children of the research.

At the beginning of each session the mothers made educational materials to use during the following week in teaching their children at home. Inexpensive materials or items commonly found in the home were incorporated into these activities: a sock puppet; a homemade flannel board; lotto and matching games which used gummed seals, geometric shapes, and color chips; counting books made from magazine pictures; sorting and matching activities using miscellaneous household items and an egg carton for a sorting tray; classifying activities based on pictures cut from furniture and clothing catalogs. The teachers taught the mothers appropriate songs and finger plays and distributed copies of the words as a teaching aid at home. In addition, books and puzzles were available on a lending-library basis. Generally, materials were chosen to stress useful vocabulary, basic manipulative skills, and math readiness concepts. Language development was the major emphasis of all activities which were designed to teach the child the words he needs to label the objects in his immediate environment, to make more precise verbal observations, to generalize, to use grammatically correct forms, to understand and to ask questions, and to formulate answers.

The teachers worked to achieve cooperative planning and to incorporate suggestions from the group. They discouraged the view that teachers are authority figures who issue directions. During a coffee break, mothers informally reported on their success or difficulty with the previous week's teaching assignment. They discussed differences among their children and ways in which the materials might be adapted. The teachers emphasized the importance of repeating and extending the use of materials made earlier in the program. For example, mothers taught their children the names of five geometric shapes by using cutouts and a felt board and later used these same materials for color and counting exercises. Mothers recorded the time spent daily working with their children on the various teaching assignments and turned in these checklists the following week.

An average of seven mothers attended each meeting. When a mother was absent, the other mothers made the materials for her and the teacher delivered these and the instructions for their use to the home the following week. In addition, the teacher visited each home at two-week intervals to become acquainted with the child, to demonstrate teaching techniques, to evaluate the appropriateness of the activities by observing mother and child at work, and to assess the extent to which mothers were working with their children.

RESULTS

Intellectual Functioning

The results of the study confirm the hypothesis that the experimental subjects would evidence gains in intellectual functioning as measured by the Stanford-Binet Individual Intelligence Scale significantly greater than those made by the control subjects. The mean gain of the experimental group was 7 points, while the control group made no gain (Table 2).

Table 2

Stanford-Binet Mean IQ

Group	N	Test 1	Diff.	Test 2
Experimental	12	90.8	7.0	97.8
Control	12	96.0	- .2	95.8
Difference		5.2	7.2	- 2.0
t		1.10	2.13	.45
Level of Significance		NS	.025*	NS*

*One-tailed t test

Two children in the experimental group scored lower (two and eight points) at the time of test two than they had at test one. Six children in the control group regressed from one to ten points. Four experimental subjects made substantial gains, from thirteen to twenty-eight points; no control subject made a gain of more than ten points. In a short-term study, this pattern of relatively large gains coupled with relatively few regressions is encouraging and supports the premise that these mothers were effective in stimulating the intellectual development of their children at home.

Language Development

Initially, both groups obtained scores below their mean chronological ages on all ITPA subtests except Auditory-Vocal Sequencing. The areas of greatest deficit were those representing verbal expressive abilities (Auditory-Vocal Automatic, Auditory-Vocal Association, Vocal Encoding) and Motor Encoding and Visual-Motor Sequencing. Although there were no significant differences between the initial performances of the groups, the control group was less deficit on all ITPA subtests. Its pretest performances were from one to seven months less deficit than those of the experimental group, and there was a trend (.10) in favor of the control group on the Auditory-Vocal Association subtest. Although there were no significant differences between the groups on the posttest, their relative positions were generally reversed. The experimental group now scored from one to seven months higher than the control group on five of the nine subtests (Table 3 and Figure 1).

Table 3

Illinois Test of Psycholinguistic Abilities
Mean Language Age Difference Score

Variable	Group*	Test 1	Test 2	Gain	Diff in Gains	t	Level of Significance One-Tailed
Auditory-Vocal Automatic	Experimental	-13.0	- 8.3	4.7	4.3	.95	NS
	Control	-11.8	-11.4	.4			
Visual Decoding	Experimental	- 7.6	.8	8.4	6.8	1.55	.10
	Control	- 2.3	- .7	1.6			
Motor Encoding	Experimental	- 8.6	- 9.1	- .5	-3.8		
	Control	- 6.5	- 3.2	3.3			
Auditory-Vocal Association	Experimental	-13.0**	- 9.0	4.0	3.1	1.05	NS
	Control	- 6.1	- 5.2	.9			
Visual-Motor Sequencing	Experimental	- 8.2	4.4	12.6	6.9	1.17	NS
	Control	- 5.4	.3	5.7			
Vocal Encoding	Experimental	-15.6	-11.8	3.8	1.6	.46	NS
	Control	-10.9	- 8.7	2.2			
Auditory-Vocal Sequencing	Experimental	5.0	11.8	6.8	7.9	1.66	.10
	Control	6.3	5.2	-1.1			
Visual-Motor Association	Experimental	- 6.8	- 2.4	4.4	7.6	1.55	.10
	Control	- .3	- 3.5	-3.2			
Auditory Decoding	Experimental	- 4.3	- 1.2	3.1	- .7		
	Control	- 3.4	.4	3.8			
ITPA Total	Experimental	- 8.0	- 2.4	5.6	4.3	1.52	.10
	Control	- 4.4	- 3.1	1.3			

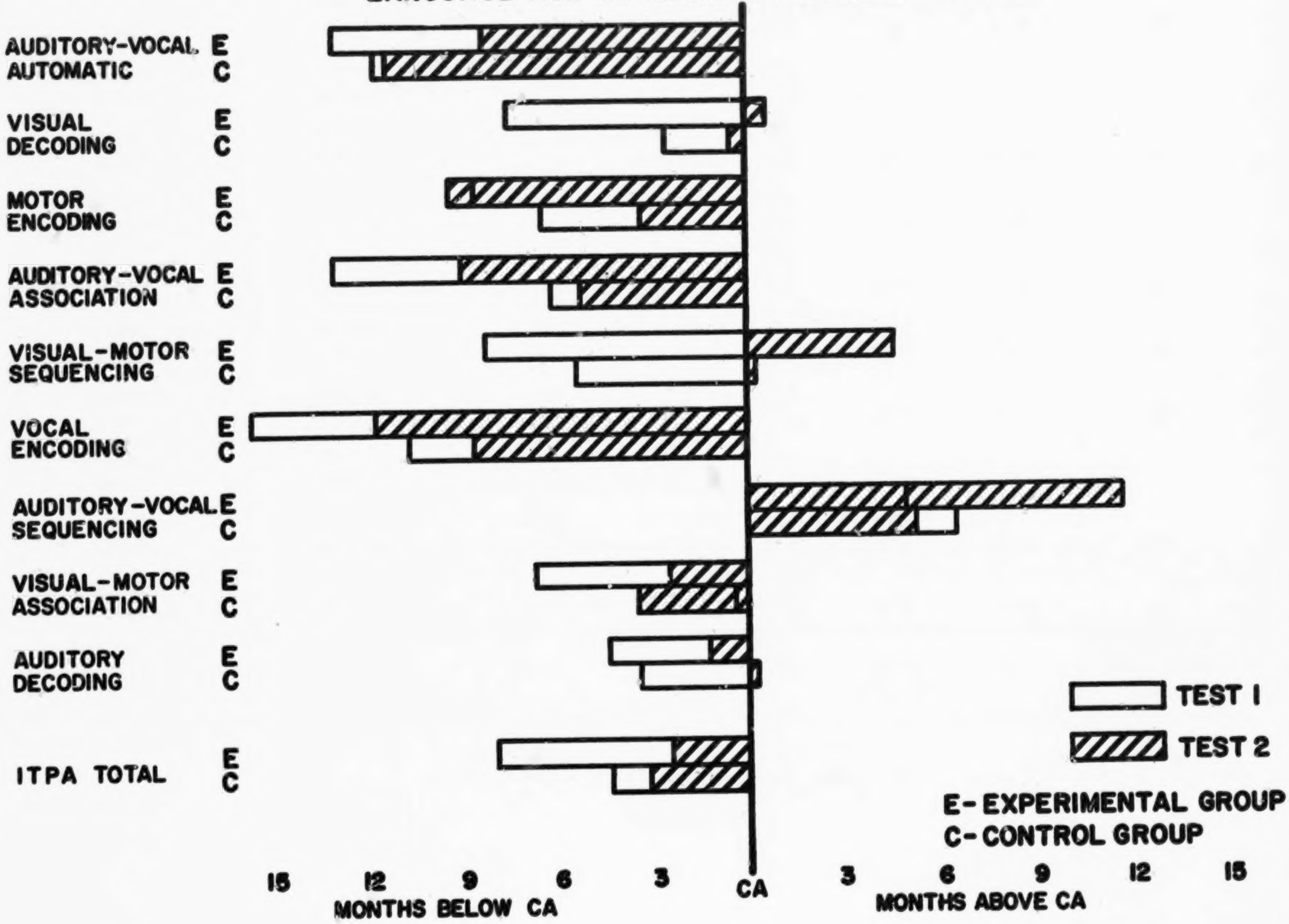
NOTE: To relate language age to chronological age, difference scores (in months) were computed by subtracting a child's chronological age at the time of testing from his language age.

* Complete ITPA data were not available for three children. The N for the Experimental group is 11; the N for the control group is 10.

**A significant difference at the .10 level on Test 1.

FIGURE I

ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES
LANGUAGE AGE DIFFERENCE SCORES IN MONTHS



It had been hypothesized that the experimental subjects would make gains in language development significantly greater than those of the control subjects. The results do not clearly confirm this hypothesis. There were no significant differences in favor of the experimental group in gains on any subtest; however, on three subtests and the ITPA total there was a trend (.10) in their favor. The gains of the experimental group exceeded those of the control group by two to eight months on seven of the nine subtests and on all subtests of major initial deficit except Motor Encoding. On eight of the nine subtests the gains of the experimental group were at least twice the program interval of approximately three months. The control group achieved this level of gain on only three subtests.

DISCUSSION

This intervention, teaching mothers to make educational activities from low-cost materials to use at home, was not determined by budgetary requirements; rather, it was chosen as an appropriate means of insuring the mother's active participation in the meeting and her effective teaching at home. Since she had made the materials herself and understood their educational function, she approached the teaching of her child with confidence and enthusiasm. The practical nature of this program in terms of facilities, personnel, and budget does, however, increase its potential for reaching increased numbers of children. In communities where funds and facilities are limited, a mother-training program could provide an appropriate alternative to a preschool experience for disadvantaged children. In areas of sparse population, it might prove more feasible to transport mothers on a weekly basis than children on a daily basis. The results of this study, particularly in view of its short-term nature, are encouraging and seem to be a clear demonstration that mothers can be effectively involved in direct educational intervention with their preschool children at home.

The Impact of At-Home Instruction by Mothers on Performance in the Ameliorative Preschool

Merle B. Karnes, Audrey S. Hodgins,
and James A. Teska

Because of the encouraging results obtained in the twelve-week study (The Effects of Short-Term Instruction at Home by Mothers, pp. 197-203) and in order to develop a more positive relationship between home and preschool, the mother-involvement program was expanded the following year and coordinated with the child's participation in the Ameliorative preschool. It was expected that children whose mothers worked with them at home in areas related to those taught at the preschool would make additional progress. The evaluation, therefore, involved a comparison of the progress of children taught by their mothers at home and by teachers at the preschool with that of the earlier group of children who had received instruction only in the preschool. The specific intent of this study was to determine areas in which instruction by mothers influenced performance.

METHOD

The Ameliorative program provided all children in this study has been described previously (pp. 52-55). The mother-involvement program was conducted along the lines of the earlier, short-term study. Again mothers were paid $3.00 to attend weekly, two-hour meetings but received no remuneration for the additional time spent working with their children at home. The three teachers who conducted the meetings for mothers also taught these children at the preschool and made a major effort to coordinate the teaching efforts at home with those at school. Mothers were encouraged to feel that their assistance was needed to support and extend the educational goal of the preschool. Materials were chosen to reinforce specific content currently being taught in the Ameliorative classroom and generally to emphasize language development, basic visual-motor skills, and math readiness concepts. At the beginning of each meeting mothers again made instructional materials to use during the following week in teaching their children at home: activities which stressed labeling, sorting, and classifying; number-object association; opposites; and numeral and alphabet recognition. A discussion of appropriate ways to use these materials at home followed each work period as did an informal report on success or difficulty with the previous week's teaching assignment. When a mother was absent, the other mothers made the materials for her, and the teachers delivered these and the instructions for their use to the home the following day. Books, games, and puzzles were available on a lending-library basis for the mothers to take home.

An additional dimension to the mother-involvement meetings, primarily made possible by the extended length of the program (from twelve weeks to seven months), was an emphasis on broader community interactions. Mothers became acquainted with and were helped to use available community resources. Occasional meetings were given over to these experiences: a visit to the public library which included an introduction to the children's library, an explanation of bookmobile services, and the acquisition of library cards; a visit to the University art museum where mothers saw in the evening the same exhibit which their children had enjoyed that afternoon during a preschool field trip; attendance at the city council meeting when open housing was to be discussed.

Although a child's acceptance into this program was contingent upon his mother's willingness to participate in the meetings, a child was not later excluded from the program when his mother failed to attend. About half of the mothers were present at a typical meeting, and about one-fourth essentially did not participate in the mother-involvement program. It is important to keep in mind, however, that when a mother was absent the materials were delivered to her home. Teachers felt that this follow-up visit was imperative in maintaining the involvement of the mothers. Thus, a mother who may have had poor attendance for very legitimate reasons (the arrival of a new baby, major surgery and hospitalization, working hours which conflicted with meeting dates) could implement the essential goals of the program with her child at home.

Recruitment procedures were the same as those employed in the earlier studies. Race and sex ratios and the three intelligence strata were maintained for the two Ameliorative classes which incorporated the mother-involvement program in consecutive years (Table 1).

RESULTS

Statistical treatment of the Binet, Frostig, ITPA total, and Metropolitan data employed a multivariate analysis of covariance using initial Binet and ITPA total scores as covariates. Since the Frostig was not included in the pre-battery for the mother-involvement group, these data were not available for use as a covariate. The F ratio for the multivariate test approached but failed to reach significance, and an examination of the univariate F's and the five sets of test scores revealed very similar performances between groups on all instruments except the ITPA (Table 2). The origin of the one differential performance was clearly shown on the multivariate analysis of ITPA subtests where the F ratio reached statistical significance (Table 3). On four subtests the differences between the two groups reached significance in favor of the children who participated only in the Ameliorative preschool and whose mothers did not participate in weekly meetings and at-home instruction. Two of these subtests (Visual-Motor Association and Visual Decoding)

Table 1

Initial Group Composition
Ameliorative Intervention With Mother Involvement and Without

Group	N	Mean Binet CA	Mean Binet IQ	Intelligence Strata Means High	N	Middle	N	Low	N	Race Caucasian	Negro	Sex M	F
With	31*	48.4	94.5	106.0	9	93.9	12	84.8	10	10	21	17	14
Without	27**	51.9	96.0	107.2	9	95.1	10	84.4	8	9	18	13	14

*Class units established after the first year of the larger research project consisted of 16 children. One child withdrew from this group during the first year, and no data for this child is included in this study. One of these class units was funded through the Office of Economic Opportunity for the Leadership Development Program for Administrators of Preschool Centers for the Disadvantaged, Grants CG 8884 and CG 8889.

**Three children withdrew from this group before the end of the year, and no data for these children are included in this study.

Table 2

Multivariate Analysis of Covariance for the Total Battery
Ameliorative Intervention With Mother Involvement and Without

F ratio for multivariate test of equality of mean vectors = 2.1844
df = 5 and 50 P less than .0707

Variable	Group	N	Test 1 Mean	difference	Test 2 Mean	Covaried Mean	Between Mean Square	Univariate F	P Less than
Binet IQ	With	31	94.5	11.8	106.3	21.43	78.6174	1.2920	.2608
	Without	27	96.0	14.3	110.3	23.80			
Frostig PQ	With	31			96.1	45.10	51.7548	.3556	.5535
	Without	27			99.1	47.02			
ITPA Total Language Age Difference Score	With	31	-5.6	3.8	- 1.8	43.79	187.3809	8.2525	.0059
	Without	27	-3.3	6.3	3.0	47.46			
Metropolitan Reading Readiness Raw Score	With	31			41.5	-7.79	50.0887	.7541	.3891
	Without	27			40.7	-9.69			
Metropolitan Number Readiness Raw Score	With	31			10.7	-11.65	2.5900	.2135	.6460
	Without	27			10.7	-12.08			

NOTE: Initial Binet IQ and ITPA total language age difference scores were used as covariates. To relate language age scores to chronological age, a difference score (in months) was computed by subtracting a child's chronological age at the time of testing from his language age score.

Table 3

Multivariate Analysis of Covariance for the Nine ITPA Subtests Ameliorative Intervention With Mother Involvement and Without

F ratio for multivariate test of equality of mean vectors = 2.3949
df = 9 and 39 P less than .0288

Variable	Group	N	Test 1 Mean	difference	Test 2 Mean	Covaried Mean	Between Mean Square	Univariate F	P Less than
Auditory-Vocal Automatic	With	31	-12.1	1.4	-10.7	-25.36	761.5370	6.4426	.0146
	Without	27	-10.8	10.8	0.0	-16.56			
Visual Decoding	With	31	- 2.6	7.3	4.7	70.65	856.8069	4.4255	.0408
	Without	27	- .2	12.1	11.9	79.99			
Motor Encoding	With	31	- 7.0	3.4	- 3.6	33.93	339.2067	1.6651	.2033
	Without	27	- 6.6	6.8	.2	39.81			
Auditory-Vocal Association	With	31	-10.3	7.8	- 2.5	41.63	85.4575	1.2418	.2708
	Without	27	- 5.4	6.8	1.4	44.58			
Visual-Motor Sequencing	With	31	- 2.7	2.9	.2	70.01	21.7058	.3067	.5824
	Without	27	- 6.4	7.9	1.5	68.52			
Vocal Encoding	With	31	-10.9	3.8	- 7.1	41.95	870.9076	4.9519	.0309
	Without	27	-13.6	11.3	- 2.3	51.37			
Auditory-Vocal Sequencing	With	31	3.0	-1.0	2.0	3.42	114.4379	.9944	.3238
	Without	27	.9	5.3	6.2	6.83			
Visual-Motor Association	With	31	- .5	4.2	3.7	52.55	898.5444	4.0816	.0491
	Without	27	9.9	.8	10.7	62.12			
Auditory Decoding	With	31	- 4.7	2.6	- 2.1	35.25	79.6689	.7277	.3980
	Without	27	1.9	.6	2.5	38.09			

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

emphasize visual skills, an area in which the disadvantaged children in this study (as well as in other class units in the larger research project) showed no substantial initial deficit. The other two subtests (Auditory-Vocal Automatic and Vocal Encoding) require verbal expressive abilities and represent an area of major and critical deficit for the disadvantaged children in this study and in the larger research project.

The statistically significant difference on the Visual-Motor Association subtest in favor of the group which participated only in the Ameliorative program is somewhat misleading, and it cannot be inferred that this group made greater progress during the program interval. This group obtained a mean initial score ten months above its chronological age and maintained this level of performance on the posttest. The mother-involvement group, at chronological age initially, gained four months in addition to the program interval, a gain larger than that of the other group. The group without mother involvement also obtained significantly higher scores on the Visual Decoding subtest; however, neither group had demonstrated a major initial deficit and both groups made substantial progress. Since both of these subtests were in the visual area where initial deficits were small, the inferior performance of the children who attended the Ameliorative program and received at-home instruction is not a matter of great concern, although this performance is somewhat puzzling since many of the mother-made activities for use at home emphasized visual skills.

On the other hand, the significantly lower scores of the mother-involvement group on two subtests requiring verbal expressive abilities are a matter of real importance. On both subtests, Auditory-Vocal Automatic and Vocal Encoding, both groups showed comparable and severe initial deficits. The progress (eleven months in excess of the program interval) of the group participating in the Ameliorative program without mother involvement resulted in a nondeficit test-two performance on both subtests while the progress of the other group was minimal and substantial deficits remained on both subtests. Although the mother-made activities and the instructions for their use at home were designed to enhance language development, mother involvement apparently inhibited the acceleration of verbal expressive abilities as assessed by these two ITPA subtests.

DISCUSSION

In no area of the test battery did mother involvement enhance performance, and the results favored the group who participated only in the Ameliorative program. On four ITPA subtests, two of them in the critical area of verbal expressive abilities, significantly higher scores were achieved by the children whose mothers were not involved in the program. In no way did the results of the test battery confirm the expectations of the study. Paradoxically, negative results obtained when two programs which had operated independently to achieve positive results were combined.

Any explanation of these results must necessarily be speculative. Since this study combined a mother-involvement program with a preschool program, it seems logical to examine these components to determine whether either was significantly altered when the two were combined. The Ameliorative program had been used previously with four-year-old children over a seven-month period, and the preschool operated in conjunction with the mother-involvement program was intended only to reproduce this earlier program. There is little basis to assume that subsequent Ameliorative programs were less effective than the original, and, in fact, project staff generally agreed that the later programs were superior in terms of curriculum organization and availability of materials. The mother-involvement program, however, necessarily required expansion from twelve weeks to seven months and specific accommodations since the children now received instruction at school as well as at home. In retrospect, accommodations which seemed appropriate at the time may have inhibited the performance of this group. In the earlier, short-term program the teachers delivered materials to mothers who had been absent and also made home visits at two-week intervals to evaluate the appropriateness of the activities by observing mother and child at work, to demonstrate teaching techniques, and to assess the extent to which mothers were working with their children. When the program was extended, these visits were abandoned. Teachers continued to deliver materials each week to mothers who had been absent and made the three home visits required of all teachers during the seven-month Ameliorative preschool. The weekly checklist used by each mother in the short-term study to record the time spent daily working with her child on the various teaching assignments (reading aloud, finger plays, games, counting, etc.) was also discontinued in the longer study. Since the preschool and the mother-involvement program were conducted by the same staff members, it was assumed that these teachers without the weekly checklist and the biweekly home visit would be able to evaluate the appropriateness of the activities used in at-home instruction and the effectiveness and regularity of the instruction by mothers through monitoring the child's performance at school, especially since the activities designed for at-home use closely correlated with the classroom program.

These changes, which seemed relatively minor at the time, coupled with the child's preschool attendance may have significantly altered the mother's perception of her role in this program. In the short-term study, the mother was aware that she was the only active agent for change in her child, and as she became convinced of the merit of the program, she increasingly felt this responsibility. The fact that project staff placed a similar value on her role was demonstrated to the mother by the weekly checklist and the biweekly home visits to evaluate her work. In the longer study, mothers appreciated the value of the activities for their children but may have over-emphasized the role of the preschool in achieving the goals of the program. Teachers, through their actions rather than direct statement, may have unwittingly reinforced this devaluation of mother-child interaction by making the purpose of home visits the delivery of materials to absentee mothers. The emphasis of home visits had changed from concern over mother-child interaction to concern over the presence of materials, and it was not unreasonable for some mothers to feel that the materials themselves were the essential ingredient in effecting change. Through the weekly checklist the *mother* had reported what she taught *at home*, but during the three visits made in conjunction with the operation of the preschool, the *teacher* reported on the progress of the child *at school*.

Mothers in the short-term study saw the major intent of the program to be the benefits which fell to their children. In the longer study, since the children also received the benefits of a preschool experience, the mothers tended to use the mother-involvement program to meet personal needs. Instead of a mother's program *for children*, the program may have been seen as a mother's program *for mothers*. Evaluations of the longer program, both verbal and written from teachers and mothers, support this view. Mothers frequently commented on their enjoyment of the social aspects of the program and on the genuine pleasure they experienced in making educational materials for their children, but a disturbing number of mothers also indicated at the end of the year that the primary use of these materials at home was by the child alone or under the direction of older siblings. Apparently mothers felt that they had fulfilled their responsibility to the program when they sent their children to school, attended a weekly meeting, and made educational materials, and, indeed, this level of involvement represented a major commitment. To some extent, mothers may have substituted these experiences for direct mother-child interaction, a consequence counter to the intent of the study, and that substitution may have been detrimental to the development of verbal expressive abilities. The solitary involvement of a child with the materials or their use with a sibling not trained to encourage verbal responses is consistent with such a performance.

In spite of the statistical results, project teachers continue to be enthusiastic about mother involvement in conjunction with preschool and feel that their observations of the children in the classroom support this view. Children brought the mother-made activities to school and initiated comment on these materials. Children often pressured their mothers to attend meetings and were keenly disappointed when their mothers were absent. Teachers believed that a meaningful home-school relationship had developed over the seven months and there was evidence that some mothers generalized from this preschool experience to the public school and wider community levels. Mothers commented that they felt more confident about approaching the classroom teachers of their older children since they had found the preschool teachers receptive. Mothers who had never before been involved in community action groups found the courage to join such groups and, hopefully, the confidence and commitment to sustain their participation.

Implementing the Ameliorative Program with Paraprofessional Staff

Merle B. Karnes, Audrey S. Hodgins,
and James A. Teska

It was the intent of this study to determine whether a paraprofessional teaching staff indigenous to the poverty area could, through sustained inservice training and daily supervision, implement the highly specific instructional program developed in the Ameliorative preschool. Intervention effectiveness was evaluated by comparing the performance on a standardized test battery of children taught by paraprofessionals with that of children taught by professional staff implementing the same instructional program. Four class units participated in this study. The first two were taught by professional staff and are described as the Ameliorative intervention in the earlier study, "The Effects of Five Preschool Interventions: Evaluations over Two Years." The third class unit was staffed by three, young, Negro mothers who had no previous teaching experience and no formal education beyond high school. The fourth was taught by sixteen- and seventeen-year-old girls enrolled in a high school work-study program. In addition, a qualified preschool teacher served as the paraprofessional trainer in each of the latter two units.

Positive research findings, it was assumed, would suggest ways to ease the staffing problems found in preschools for disadvantaged children throughout the country. The former U.S. Commissioner of Education, Harold Howe (1969), has suggested that the levels of responsibility of paraprofessional staff must be extended if we are to improve the educational chances of children from the ghetto and the rural slum through the means of a rewarding early childhood experience. Commissioner Howe concluded, the states must be "encouraged to recruit and train teacher aides as well as members of the local community who have not previously been involved in education" and the local school systems must be helped to find "new ways of using existing resources of the community, benefiting not only the schools but also making a substantial contribution toward the creation of new careers for members of the community [p. 10]." This study, then, goes beyond the feasibility of employing paraprofessional staff in peripheral positions and addresses itself to the question of whether such staff can be trained to assume the major responsibilities for implementing a preschool instructional program.

METHOD

Selection of Subjects

Procedures to recruit children for the class unit taught by the adult paraprofessional staff were the same as those employed in the earlier preschool studies. Race and sex ratios and the three intelligence strata were again maintained (Table 1). Recruitment procedures for the class unit taught by the teenage paraprofessional staff only approximated those used in the earlier studies. Through a cooperative arrangement this class unit was located at a community nursery school in a target area housing project. A requirement of this arrangement was that 50% of the children be recruited from the housing project. Pre-enrollment had begun at this school the previous spring and commitments to these children were honored. The community nursery, to further long-range integration goals, had recruited several children from socioeconomic levels higher than those which characterized the larger research study. It was not possible through subsequent recruitment to balance intelligence strata and sex-race categories. The high stratum for this class unit consisted of only one child while nine children were in the middle stratum, an obvious violation of the one-third rule. The sex-ratio of approximately 50% males and 50% females also was not maintained. In addition, four of the sixteen children did not meet the age criterion of this study and were three rather than four years old before December one of the recruitment year.

Intervention

The length of intervention, the daily schedule, the teacher-pupil ratios, and other aspects of classroom mechanics in the two class units taught by paraprofessionals were patterned after those of the Ameliorative preschool described earlier. (See pp. 52-55.) A major effort was made to insure that the teaching strategy employed by the paraprofessionals and the curricular units they implemented followed those of the earlier study which provided the basis for comparison. To fulfill this intent, a procedure was developed whereby a professional teacher acting as a supervisor provided inservice training for the three paraprofessional teachers under her direction. The supervisory teacher assumed full responsibility for the long-range educational goals of the program and for the specific instructional plans and was present in the classroom each day to assess the appropriateness of her plans for the children as well as the effectiveness of her paraprofessional staff in executing these plans. She did not, however, assume the role of classroom teacher herself except in ancillary ways, as, for example, in demonstration lessons or in the direction of the music program.

Before each preschool session began, the three paraprofessionals and their supervisory teacher met for a half-hour to review the specific lesson plans for the day designed to implement the Ameliorative curricula in math, language arts-reading readiness, and social studies-science. Vocabulary and concepts unfamiliar to the paraprofessionals were carefully presented by the supervisor before such material was taught the children. Role

Table 1

Initial Group Composition

Group	N*	Mean Binet CA	Mean Binet IQ	Intelligence Strata Means						Race		Sex	
				High	N	Middle	N	Low	N	Cau.	Negro	M	F
Professional	27	51.9	96.0	107.2	9	95.1	10	84.4	8	9	18	13	14
Paraprofessional (adult)	17	50.1	93.4	104.8	5	93.5	6	83.8	6	5	12	9	8
Paraprofessional (teenage)**	16	48.8	90.2	113.0	1	92.8	9	82.7	6	5	11	10	6

*Three children withdrew from the two class units taught by professional staff, and no data for these children are included in this report. An additional child was enrolled in the class taught by adult paraprofessionals when the poor attendance of one child suggested that he might be dropped from that program. His subsequent attendance improved, and both children remained in the study.

**The class unit staffed by teenage paraprofessionals was funded through the Office of Economic Opportunity for Leadership Development Program for Administrators of Preschool Centers for the Disadvantaged, Grants CG 8884 and CG 8889.

playing was often chosen as the instructional mode during these planning sessions, with the professional and the paraprofessional taking turns as pupil and teacher. The value of well-planned lessons at the child's level and the merits of praise and success in fostering maximum learning and preventing discipline problems were stressed.

After the dismissal of the preschool class, the staff met again for forty-five minutes to evaluate the completed preschool session and to plan for the following day. Each paraprofessional was provided an opportunity during the preschool session (during rest-time or during the music period which was generally under the direction of the supervisory teacher) to record anecdotal material related to the individual performances of the five children in her instructional group. These observations were used as guides in developing appropriate lesson plans for the following day. The supervisory teacher also presented a constructive critique of the teaching performances of the three paraprofessionals, offering specific alternatives where changes were desired. In addition, each supervisor rated her paraprofessional staff on an evaluation scale three times during the preschool year and discussed these ratings with the teachers individually.

The inservice training techniques adopted for the adult and teenage staff differed in relatively few ways. Because of their high-school schedules, the teenage paraprofessionals and their supervisor met only once each day, for forty-five minutes prior to the beginning of the preschool session. The major portion of this time was given to an explanation of the lesson plans for the day which included demonstrations, modeling techniques, and role playing. In addition, a typed version of each of the three lesson plans (math, language arts-reading readiness, and social studies-science) was posted at the appropriate work table. Because the post-session could not be scheduled, less time was available for the teenagers to evaluate the performances of individual children and more responsibility for child evaluation was assumed by the supervisory teacher than was the case in the classroom staffed by adult paraprofessionals. As a result, the teenagers were less able to contribute to lesson planning later in the year when the adult paraprofessionals were offering suggestions and improvisations.

Evaluation Procedure

To evaluate the effectiveness of paraprofessional staff in implementing a highly specific preschool instructional program the performance on a standardized battery of tests of children taught by paraprofessionals was compared to that of children taught by professional staff implementing the same instructional program. Intervention effectiveness was judged in terms of the overall school readiness of disadvantaged children as represented in the following test battery:

1. Intellectual functioning as measured by the 1960 Stanford-Binet Individual Intelligence Scale, Form L-M, administered prior to and at the end of the preschool intervention.

2. Language development as measured by the Illinois Test of Psycholinguistic Abilities, experimental edition, 1961, administered prior to and at the end of the preschool intervention.

3. Visual perception as measured by the Frostig Developmental Test of Visual Perception, administered prior to and at the end of the preschool intervention.

4. The Metropolitan Readiness Tests administered at the end of the preschool intervention.

With the exception of the Metropolitan which was administered by a trained tester, qualified psychological examiners administered all tests at a school site and were not informed of the program assignment of the children.

RESULTS

Statistical Procedure

Statistical treatment of the total battery data (Binet, ITPA total, Frostig, and Metropolitan) employed a multivariate analysis of covariance using initial Binet, ITPA total, and Frostig scores as covariates. Since the Metropolitan was not given until the end of the preschool year, scores from this instrument were not available for use as covariates. A separate multivariate analysis of covariance of ITPA subtest data used the initial scores from the nine subtests as covariates. When multivariate F's were significant, Newman-Keuls tests at the .05 level were conducted in those instances when univariate F's were also significant.

Total Battery

The F ratio for the multivariate test of equality of mean vectors for the five instruments in the test-two battery was not significant (Table 2). The performances of the Ameliorative classes taught by professional staff, adult paraprofessionals, and teenage paraprofessionals were nondifferential on all instruments, and all groups made nearly equal progress. Particularly on the assessment of general school readiness (Metropolitan) and visual perception (Frostig) were the similarities among performances striking.

Table 2

Total Battery Multivariate Analysis of Covariance

F ratio for multivariate test of equality of mean vectors = 1.2894

df = 10 and 100 P less than .2467

Variable	Group	N	Test 1 Mean	diff.	Test 2 Mean	Covaried Mean	Between Mean Square	Univariate F	P less than
Binet IQ	Professionals	27	96.0	14.3	110.3	1.11	15.6783	.4082	.6669
	Paraprofessionals (adult)	17	93.4	12.5	105.9	- .64			
	Paraprofessionals (teenage)	16	90.2	14.4	104.6	.56			
Frostig PQ	Professionals	27	80.7	18.4	99.1	66.34	11.3699	.0822	.9212
	Paraprofessionals (adult)	17	79.4	20.1	99.5	67.52			
	Paraprofessionals (teenage)	16	74.3	23.8	98.1	67.73			
Metropolitan Reading Readiness Raw Score	Professionals	27			40.7	-18.24	51.1482	.9985	.3752
	Paraprofessionals (adult)	17			41.2	-16.41			
	Paraprofessionals (teenage)	16			36.4	-20.01			
Metropolitan Number Readiness Raw Score	Professionals	27			10.7	-11.41	18.9691	1.8513	.1669
	Paraprofessionals (adult)	17			8.4	-13.21			
	Paraprofessionals (teenage)	16			8.0	-12.84			
ITPA Total Language Age Difference Score	Professionals	27	- 3.3	6.3	3.0	43.17	61.1276	2.2528	.1149
	Paraprofessionals (adult)	17	- 5.5	4.4	- 1.1	40.49			
	Paraprofessionals (teenage)	16	- 6.9	4.3	- 2.6	39.91			

NOTE: Initial Binet IQ, Frostig PQ, and ITPA total language age difference score were used as covariates. To relate language age to chronological age, a difference score was computed by subtracting a child's chronological age at the time of testing from his language age score.

Intellectual Functioning

The differences mentioned previously in the composition of the class unit taught by teenagers make comparisons of distribution of gains and gains by strata difficult. These data do, however, suggest that children taught by paraprofessionals did not make large gains as consistently as did the children in the Ameliorative program staffed by professionals. Seventy-four percent of these children made gains of ten or more points, but only 53% of the children taught by adult paraprofessionals made gains of this magnitude. Further, gains by strata, in so far as strata among groups were comparable, were not as consistent in either paraprofessional program. In the Ameliorative preschool staffed by professionals, the gains of children in each of the three intelligence strata rather closely approximated the mean gain. In the class staffed by paraprofessional adults, the gain of the five children in the high stratum was only half that of the six children in the low stratum. In the program with teenage teachers, the mean gain of the six children in the low stratum (21.5 points) was responsible for a rather large proportion of the group mean gain (14.4 points).

Language Development

The F ratio for the multivariate test of equality of mean vectors for the nine ITPA subtests was not significant (Table 3). There were no significant differences among the subtest performances of the Ameliorative classes taught by professionals, adult paraprofessionals, or teenage paraprofessionals. The disadvantaged children in the three groups in this study, as well as those in other similarly constituted groups throughout the research project, consistently demonstrated major initial deficits on three subtests: Auditory-Vocal Automatic, Auditory-Vocal Association, and Vocal Encoding. In addition to the specific aspects of language functioning measured, the ability to express oneself verbally is the common requisite for successful performance on these three subtests. These sharply limited abilities are a crucial challenge to preschool teachers of the disadvantaged.

Although subtest differences in this area did not reach significant levels, an important trend can be noted among the performances of the three groups. All groups entered the program with major deficits on the Auditory-Vocal Automatic subtest, but only the group taught by professional staff was functioning at its chronological age at the end of the preschool intervention. These children made gains eleven months in excess of the program interval. Children taught by adult paraprofessionals made more modest gains (four months) and continued to demonstrate a substantial deficit. Children taught by the teenage staff made negligible progress (one month), exhibiting a major deficit of fifteen months at the completion of the program. A rather parallel pattern can

Table 3

Multivariate Analysis of Covariance for the Nine ITPA Subtests

F ratio for multivariate test of equality of mean vectors = 1.5296

df = 18 and 80 P less than .1015

Variable	Group	N	Test 1 Mean	diff.	Test 2 Mean	Covaried Mean	Between Mean Square	Univariate F	P less than
Auditory-Vocal Automatic	Professionals	27	-10.8	10.8	.0	-10.56	209.8384	1.6500	.2028
	Paraprofessionals (adult)	17	-13.6	4.4	- 9.2	-15.04			
	Paraprofessionals (teenage)	16	-16.6	1.4	-15.2	-19.42			
Visual Decoding	Professionals	27	- .2	12.1	11.9	37.17	36.2340	.1351	.8740
	Paraprofessionals (adult)	17	- 3.7	12.8	9.1	34.37			
	Paraprofessionals (teenage)	16	- 3.8	9.4	5.6	34.05			
Motor Encoding	Professionals	27	- 6.6	6.8	.2	44.15	489.8713	2.8677	.0667
	Paraprofessionals (adult)	17	- 7.8	- .9	- 8.7	32.91			
	Paraprofessionals (teenage)	16	- 9.5	2.8	6.7	34.69			
Auditory-Vocal Association	Professionals	27	- 5.4	6.8	1.4	28.51	153.0205	2.7155	.0764
	Paraprofessionals (adult)	17	-12.6	8.7	- 3.9	27.19			
	Paraprofessionals (teenage)	16	-11.4	3.6	- 7.8	21.32			
Visual-Motor Sequencing	Professionals	27	- 6.4	7.9	1.5	73.47	119.5779	1.8395	.1700
	Paraprofessionals (adult)	17	- .6	- 1.5	- 2.1	69.93			
	Paraprofessionals (teenage)	16	- 5.2	7.4	2.2	75.88			
Vocal Encoding	Professionals	27	-13.6	11.3	- 2.3	3.81	47.8093	.3271	.7227
	Paraprofessionals (adult)	17	-14.6	6.9	- 7.7	.38			
	Paraprofessionals (teenage)	16	- 1.5	- 4.6	- 6.1	.62			
Auditory-Vocal Sequencing	Professionals	27	.9	5.3	6.2	3.98	140.8083	.8201	.4465
	Paraprofessionals (adult)	17	1.4	5.2	6.6	5.02			
	Paraprofessionals (teenage)	16	- 3.1	.2	- 2.9	- 1.58			
Visual-Motor Association	Professionals	27	9.9	.8	10.7	98.05	552.1898	2.8529	.0675
	Paraprofessionals (adult)	17	2.6	7.5	10.1	95.30			
	Paraprofessionals (teenage)	16	- 2.2	1.0	- 1.2	84.30			
Auditory Decoding	Professionals	27	1.9	.6	2.5	59.93	193.3825	1.3031	.2812
	Paraprofessionals (adult)	17	- 2.2	2.7	.5	59.84			
	Paraprofessionals (teenage)	16	- 4.7	11.1	6.4	67.23			

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

be seen in the pre- and post-intervention performances on the Auditory-Vocal Association subtest. Again all groups had large initial deficits and again only the children taught by professional staff demonstrated a nondeficit test-two performance. The gain made by the children taught by adult paraprofessionals, however, was actually the largest of the three gains, and their relatively minor deficit at test two reflects the magnitude of their initial deficit rather than inadequate progress. The children taught by teenagers again made the least progress (only four months) and performed relatively poorly on test two. On the Vocal Encoding subtest the class unit assigned to the teenage staff did not show the initial major deficit demonstrated by the other class units in this study or in the larger research project. An examination of individual subtest scores reveals that five of the relatively higher socioeconomic status children included in this class unit scored far above their age level on this subtest and helped to produce an inflated mean. Nine of the sixteen children in this class unit did, however, demonstrate deficits in Vocal Encoding which ranged from 12 to 21 months. On this important subtest only the children taught by professional staff achieved an essentially nondeficit test-two performance. The children taught by adult paraprofessionals made good progress (7 months in excess of the test interval) but maintained a relatively large deficit of 8 months. The children taught by teenagers, in spite of their atypical initial performance, regressed five months during the preschool program, and their test-two deficit approached major proportions. Quite clearly, then, on the three subtests related to the critical area of major deficit, verbal expressive abilities, the effectiveness of the paraprofessional staffs did not match that of the professional teachers. Supervisory teachers of both paraprofessional staffs were aware of this discrepancy early in the program, particularly in regard to the role of the Ameliorative teacher in providing a specific language model for the child to pattern.

On one other subtest, Motor Encoding, differences in test-two performances merit comment. Initially the three groups of children showed substantial and relatively comparable deficits (7 to 10 months). Only the children taught by professional staff achieved a nondeficit test-two performance. The children taught by teenagers showed little progress and those taught by the adult paraprofessionals actually demonstrated a small loss. Both groups remained substantially deficit. The supervisory teachers noted that the paraprofessionals at both age levels tended to show somewhat inhibited motoric involvement when demonstrating materials, when acting-out stories, and when directing musical activities and group exercises and games. The adult paraprofessionals were reluctant to initiate and carry out these kinds of activities, and the teenagers often exhibited embarrassment before each other and the supervisory teacher and self-consciousness with the children. In general, these staff members found it difficult to respond in situations which demanded motoric spontaneity.

CONCLUSIONS

The staff variables explored in this study (professional, adult paraprofessional, and teenage paraprofessional) did not produce significantly differential performances on any component of the evaluation battery. Only minor qualifications need be made: (1) There is some evidence that children instructed in the Ameliorative curriculum by paraprofessionals did not achieve large IQ gains as consistently as did the children taught by professionals. (2) IQ gains by intelligence strata in classes taught by paraprofessional staff were not as uniform as those in classes taught by professional teachers. (3) Relatively poor performances on the Motor Encoding subtest of the Illinois Test of Psycholinguistic Abilities and on the three subtests related to verbal expressive abilities were demonstrated by children taught by paraprofessionals. Generally, however, the results of this study clearly endorse the feasibility of alleviating preschool staffing problems through employing paraprofessional teachers who receive sustained inservice training and daily supervision. The paraprofessionals, adult and teenage, who participated in this study did indeed demonstrate the ability to implement the highly specific instructional program developed in the Ameliorative preschool as effectively as professionally trained teachers.

CONSIDERATIONS INVOLVED IN PARAPROFESSIONAL STAFFING

Although the analysis of the evaluation battery did not reveal significant differences between the group taught by the adult paraprofessionals and the group instructed by teenagers, the supervisory teachers in written evaluations of their respective staffs described conspicuous and pertinent variables. The performances of the adult paraprofessionals in all aspects of these evaluations were rated superior to those of the teenage teachers. Such a result is, of course, not surprising since the girls who participated in the high school work-study program were considered drop-out prone and the cooperative work program had, in fact, been instituted by the high school as a means for holding such students in school. Although the paraprofessionals at both age levels lacked teaching experience and knowledge concerning the goals of a preschool and the methods for achieving such goals, the teenagers failed to acquire a genuine sense of commitment to the program which the adult paraprofessionals (all mothers themselves) developed almost immediately. The teenagers exhibited rather chronic absenteeism which was never demonstrated by the adult paraprofessionals. Personnel turnover was high among the teenage staff: One girl left after six weeks to be married; one left during the first semester because of pregnancy; one left after a week because of inadequate reading skills which made it impossible for her to follow written lesson plans or to read stories aloud to children. A total of six girls served as teachers in this classroom while the three adult paraprofessionals remained with the program to the end. These personnel problems placed unusual demands on the supervisory teacher for the teenage staff. She found it necessary, for example, to teach for six consecutive weeks because a suitable teenage replacement could not be found. Even under routine circumstances she was required to teach once or twice a week because of the high absentee rate of the teenagers. It is very possible that the creditable performance of the children in this class unit may be in large measure due to the dedication and energy of the supervisory teacher rather than to the effectiveness of her teenage teaching staff.

The teenagers tended to be somewhat defensive about suggestions which seemed in any way critical of their work. They often saw the supervisor as "another high school teacher," an authority figure with whom they did not identify and toward whom they felt somewhat rebellious. The adult paraprofessionals, on the other hand, viewed their supervisor as "part of the team" and were eager to extend their responsibilities within the classroom and to participate in planning and evaluation sessions. The supervisory teacher of the teenage staff felt that although these young teachers acquired many of the skills necessary to present curriculum materials to young children and to handle discipline problems in a constructive manner, their growth as teachers was limited because they did not adequately develop the ability to evaluate objectively the progress made by the children within their instructional groups. They tended to characterize individual performances in global terms ("just fine" or "terrible") and to demonstrate few insights into a child's specific learning problems and the appropriate help they might provide. Often the teenagers were unable to go beyond their own needs and interests and sense the needs of the children and of the overall program. They were, after all, adolescents with adolescent problems who found it difficult to focus thought and energy beyond their immediate concerns of personal appearance and social relationships. The young mothers found less difficulty in observing and evaluating child behavior and became rather ardent and articulate promotors of the preschool program.

The teenagers saw little relevance in this work experience for their occupational future while the paraprofessional adults sensed the relevancy of this experience to their roles at home and in the community and considered such training pertinent to future employment goals. While each supervisory teacher agreed that her staff had gained knowledge, techniques, and understanding during their service at the preschool, there seemed little question that in terms of transfer to the field the inservice training of adult paraprofessionals (in this instance young mothers) indigenous to the poverty area as teachers of disadvantaged children was a more feasible tactic than was a similar program for teenage girls. It must be remembered that these very encouraging results were obtained with inexperienced people in a training program which ran for only seven months. The supervisor of the adult paraprofessionals believed that in subsequent years her staff would become even more effective teachers. In fact, she considered one member of her paraprofessional staff competent to teach independently and, perhaps of even greater importance, qualified to serve as a supervisor-trainer of other paraprofessionals.

It might have been assumed that implementing a highly structured instructional program would make the training of paraprofessional staff even more arduous. This did not prove to be the case. The supervisor of the adult paraprofessionals felt that the choice of the Ameliorative curriculum may have been critical to the success of the program. Structured programming proved to be a rather ideal vehicle for training paraprofessionals: (1) The paraprofessional teacher approached her teaching with confidence since she knew precisely what she was to do. (2) She was able to evaluate immediately her effectiveness as a teacher by observing the child's performance on defined tasks. (3) She could see the specific results of her efforts in the day-to-day development of the children. Although these observations were required to implement the structured curriculum, they also served to reward teaching efforts by emphasizing child growth.

The Effects of the Ameliorative Program with a Class of Low IQ Children

Merle B. Karnes, Audrey S. Hodgins,
and James A. Teska

The class unit definition of this research project (one third of the children with initial IQ's of 100 and above; one third, 90 through 99; and one third, 70 through 89) resulted in a mean IQ for each class unit higher than the mean of the population screened. Consequently, high strata were difficult to fill, and recruitment each year resulted in low strata subjects who could not be placed. In the third year of the project, the fifteen four-year-old disadvantaged children for whom there were no vacancies in low strata or who fell below the cut-off of 70 were enrolled in a single class whose definition was an IQ below 75. It was assumed that these scores validly represented the level of intellectual functioning of the children, since qualified psychological examiners had administered the tests. It was not assumed, however, that a more complete psychological evaluation would have resulted in a diagnosis of mental retardation for many of these children. The subjects were not labeled retardates, although the teaching staff was aware of the atypical composition of this research class (Table 1).

Table 1

Initial Group Composition

N	Mean Binet CA in Months	Binet IQ Range	Mean Binet IQ	Race		Sex	
				Cau.	Negro	M	F
15	49.7	37 - 74	66.4	4	11	10	5

Classroom mechanics, teaching strategy, and curricula were essentially the same as those provided other Ameliorative classes (pp. 52-55). Teachers anticipated, of course, that these children might not cover certain units of work since similar curricular accommodations had previously been made between high and low strata children in other classes. The basic intent of the research was to evaluate the effectiveness of the Ameliorative program with this atypical group rather than to devise a new intervention program.

RESULTS AND DISCUSSION

Since no control group was available for comparison with this atypical class and since the other research class units, obviously not drawn from the same population, could not be used for direct statistical comparison, the evaluation of this group relies only on a consideration of gains.

Intellectual Functioning

The Stanford-Binet IQ gain of 21 points made by the low IQ children was statistically significant at the .001 level (Table 2). This gain exceeds the gain of 13.8 points made by the twenty-four children who participated in the two earlier Ameliorative classes (p. 64). A somewhat more appropriate comparison can be made with the seven children in the low strata (70 through 89) in these two class units who had an initial IQ mean of 84.6 and made a gain of 16.0 IQ points.

Table 2

Mean Stanford-Binet IQ

Test 1	Test 2	Difference	t	Level of Significance
66.4	87.5	21.1	9.34	.001

The consistency with which the children in the earlier Ameliorative classes made gains was also demonstrated by the low IQ children (Table 3). No child made a gain of less than five IQ points and 80% of the children made gains of 15 or more points. Although IQ strata as defined in the earlier study did not exist within this group, the gains of the relatively high IQ children (70-74) were paralleled by the gains of the lowest children in the class (Table 4). The uniformly substantial gains in intellectual functioning of the low IQ children reflect the effectiveness of the Ameliorative program with children who demonstrated a sharply limited potential for school success.

Table 3

Distribution of IQ Gains

Gain in IQ Points	Percent	N
35 - 39	7	1
30 - 34	7	1
25 - 39	20	3
20 - 24	27	4
15 - 19	20	3
10 - 14	7	1
5 - 9	13	2
0 - 4	0	0

Table 4

Binet IQ Gain by Initial IQ Level

Initial IQ Level	N	Mean IQ Gain
70 - 74	7	20.6
60 - 69	6	21.7
59 and below	2	21.6

Language Development

Assessment of the language development which occurred during this program is extremely difficult since many low IQ children were initially unable to perform on various ITPA subtests and were arbitrarily assigned the lowest language age score provided in the normative tables, following the precedent of the earlier studies. This convention had little influence on the subtest means reported in the earlier studies because few children were given such scores; however, in this study the influence of this convention was critical, and initial scores do not reflect the magnitude of deficit (Table 5). Since the initial level of deficit could not be assessed with accuracy, statistical tests of gains were inappropriate. To some extent, the positive impact of the program can be seen in the increased numbers of children scoring within the subtest norms at test two (Table 6). At test one, essentially none of the fifteen children were able to perform on four subtests; on two additional subtests, nine children scored below the norms. At test two, with the exception of the Auditory-Vocal Automatic subtest, virtually all of the children fell within the normative range of this instrument.

After the program intervention, when the low IQ children were generally able to score in the range of the ITPA norms, substantial deficits remained, particularly on subtests requiring expressive abilities. Severe deficits (over 12 months) were found on five ITPA subtests and sizeable deficits were shown on the other four. The extremely limited verbal development of these children, even after the intervention program, suggests that their academic potential will continue to be restricted.

Table 5

ITPA Language Age Difference Score
Means in Months

ITPA	Test 1	Difference	Test 2
Auditory-Vocal Automatic	-20.6	-4.4	-25.0
Visual Decoding	-14.9	8.2	- 6.7
Motor Encoding	-19.1	-1.5	-20.6
Auditory-Vocal Association	-20.0	3.7	-16.3
Visual-Motor Sequencing	-14.6	.6	-14.0
Vocal Encoding	-22.1	2.8	-19.3
Auditory-Vocal Sequencing	- 6.9	-4.0	-10.9
Visual-Motor Association	- 9.7	1.8	- 7.9
Auditory Decoding	-14.1	5.0	- 9.1
Total ITPA	-17.2	2.9	-14.3

NOTE: To relate language age scores to chronological age, a difference score was computed by subtracting a child's chronological age at the time of testing from his language age score.

Table 6

Number of Children Scoring below ITPA Norms

ITPA	Test 1	Test 2
Auditory-Vocal Automatic	13	7
Visual Decoding	9	0
Motor Encoding	13	1
Auditory-Vocal Association	12	1
Visual-Motor Sequencing	9	4
Vocal Encoding	12	1
Auditory-Vocal Sequencing	5	1
Visual-Motor Association	3	2
Auditory Decoding	6	2
Total ITPA	7	1

SUMMARY

This discouraging school prognosis at test two (a mean Binet IQ in the slow-learner range and substantial deficits on all ITPA subtests) does not invalidate the very real progress made by the low IQ children in the Ameliorative program. During the nine-month program interval, the mean Binet mental age of these children increased 19 months and their ITPA total language age, 12 months -- remarkable progress for a group of children whose initial mean IQ was 66. Clearly, a one-year intervention at this age for this population is not adequate, and earlier and sustained intervention may well be required to effect the level of change necessary for successful school performance for a substantial number of these children.

INFANT INTERVENTION STUDIES

The Effects of Early Education with Disadvantaged Infants

Samuel A. Kirk[1]

During the past decade many researchers have been interested in the cognitive, language, and perceptual development of young disadvantaged children. The literature is now replete with articles which demonstrate that intervention at the preschool level produces acceleration in rate of growth in psychological functions as measured by standard intelligence tests.

Several major theoretical and practical questions evolve from the results of preschool intervention. One question deals with the stability of the gains during the preschool level. Some data indicate that IQ's and other indices of development tend to rise during the period of intervention, but also tend to drop after the children enter school. Another question is whether the early acceleration, even if it is maintained, results in accelerated school achievement when compared to that of children who did not receive preschool intervention programs. A third question relates to the kind of preschool intervention that produces the most effective gains. A fourth question, which is the topic of this report, relates to the relative effects of providing intervention at various ages. The basic question is whether intellectual functioning can be stimulated more effectively at a very young age than at the age of four or five.

There is some precedence for believing that stimulation at the age of one or two is more effective for disadvantaged children than intervention at the age of five. The evidence for this point of view is meagre, and sometimes is inferred from diverse data. For example, Kirk (1966) compared studies which began at different ages. Figure 1 shows the results of Skeels study (1939) where intervention began at ages 1 to 2 with Kirk's results where intervention was initiated at an average age of 4½ to 6 and the studies of others where intervention began at age 6. It will be noted that within both the Skeels and the Kirk groups the training groups made significant increases, while the contrast groups declined. The Skeels group, however, in which training was initiated between ages 1 and 2, made more progress than did the training group of Kirk. The other groups initiated intervention at age 6, but did not have control children who did not attend school. The ages 6 groups did not make as much acceleration in rate of mental

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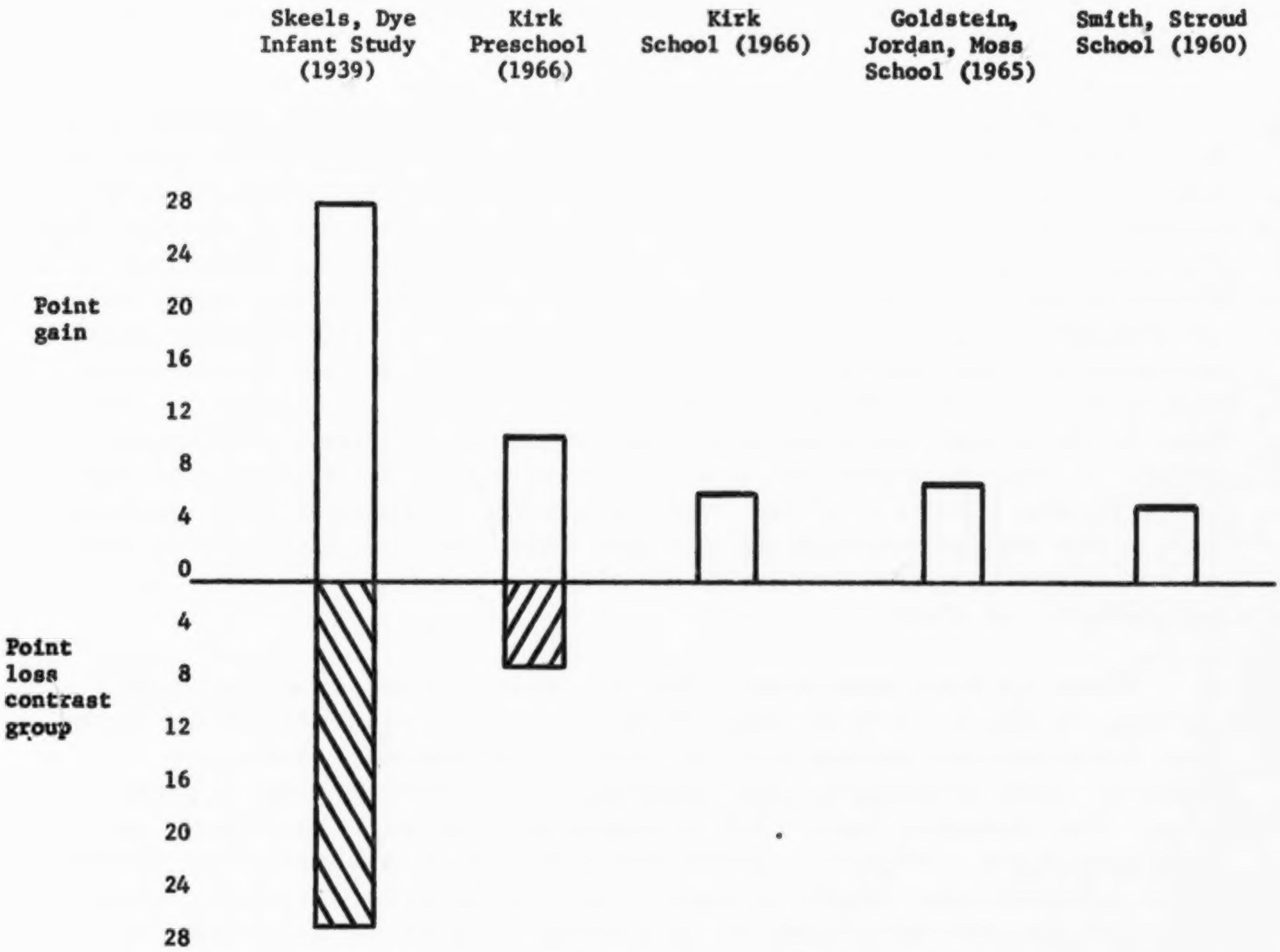
[1] Appreciation is extended to Dr. Will Beth Stephens who was in charge of this project during its initial stages and who did the original testing and evaluation and wrote the design report.

Figure 1

Changes in IQ Scores When Training is Initiated at Different Age Levels



development as did the Kirk group where intervention began at the average age of 4½. If these comparisons have merit, it would appear that the earlier the intervention, the greater the increase in rate of mental development. It should be pointed out, however, that the comparisons of different groups are not adequate proof. One difficulty in this comparison, for example, is that the Skeels group and the three groups that began intervention at age 6 did not include children with organic pathologies. Within the Kirk group one-half were children with organic pathologies.

Bloom (1964), in his studies on the stability of intelligence test results, estimated that 50% of intellectual development takes place between conception and age 4, about 30% between ages 4 and 8, and about 20% after age 8.

It would appear from these sporadic results and opinions that intervention for disadvantaged children should be initiated as soon as possible after birth and before the age of 4.

To test the notion that intervention in early childhood was most beneficial, the present experiment was designed with disadvantaged children. The general problem was to compare children who received intervention at ages 1 to 2 with children who did not receive intervention, and also to compare both groups with their siblings who received no intervention before age 4.

METHOD

The Plan of the Experiment

From a group of disadvantaged children admitted into a preschool at the age of 4, 30 siblings between the ages of eight months and two years were selected for the experiment. These thirty infants were divided into two groups, an experimental and a control group. The fifteen experimental children received daily one-hour training in their homes for one year and were then admitted into a preschool of three-year-olds the second year. The experimental children were compared with the controls after the first year and again after the second year. In addition, the test scores of both the experimental and control groups were compared with the test scores of their siblings when they had been admitted into the preschool at the age of four.

Specifically, the children (four-year-olds and infant siblings) came from families who were on the rolls of Aid to Dependent Children or Family care, who resided in Federal housing projects, or who were identified by public school authorities as being disadvantaged. All infants were examined with The Cattell Infant Intelligence Scale. Those who had IQ's between 80 and 120 and who did not evidence organic pathology on medical examinations were selected.

This group of thirty infants was divided at random and assigned to the following groups:

1. Fifteen male and female subjects, eight months to two years, were assigned to an experimental group who would receive one hour tutoring in the home each day (experimental group).

2. Fifteen male and female subjects, eight months to two years, who would not receive tutoring in the home (control group).

Characteristics of the Subjects

Table 1 presents the Cattell Infant Intelligence Scale IQ for the Experimental and Control groups and the Stanford-Binet Revised IQ for the four-year-old siblings. Attrition the first year reduced each group by one case, and the data, therefore reflect fourteen control and fourteen experimental cases. It will be noted from Table 1 that the experimental and control groups were of the same age and IQ on initial testing. There were, however, two white children in the experimental group and six white children in the control group.

Table 1

Characteristics of the Groups Prior to Training

	Experimental Group N=14	Control Group N=14
Males	7	8
Females	7	6
White	2	6
Negro	12	8
Mean C.A. in months	16.9	17.0
Mean M.A. (Cattell)	16.8	16.9
Mean IQ (Cattell)	98.9	99.2
Mean IQ (Binet) of older siblings	92.1	94.1

Tests Administered

Tests and evaluations were administered to the thirty infants before the experiment and at the end, as follows:

a) During pretesting the following tests were administered: (1) The Cattell (1960) Infant Intelligence Scale, (2) Caldwell's (1966) Assessment of Home Stimulation, (3) The Fels Parent Behavior Rating Scales (Baldwin, Kalhorn, and Breese, (1949), (4) Fokes (1965a) Outline of Language Development,

(5) An Instrument for Assessing Infant Psychological Development (Uzgiris and Hunt, 1966), (6) a pediatric examination, and (7) Fokes (1965b) Outline of Motor Development. These tests and evaluations were administered initially for the purpose of studying the children and aiding in organizing a tutorial program in the home. The tests and evaluations have been described by Painter (1968).

b) Posttesting evaluations were made after one year of tutoring and after one year of preschool. Posttests that are here reported are (1) the Stanford-Binet, Revised Form L-M, and (2) The Illinois Test of Psycholinguistic Abilities (experimental edition). These tests were given only as posttests since the children were too young for these tests during the initial stages.

Description of Thirty Infants

Table 1 gives the race, sex, mean chronological ages, and Cattell IQ's of the experimental and control groups. The intelligence quotients of the 30 subjects ranged from 86 to 118. In motor development the two groups were commensurate with age level. Common, but not severe, deficits were noted in the areas of language development and symbolic representation.

Medical examinations revealed 3 subjects possessed a cardiac condition termed "heart murmur." Because 8 of the 30 subjects had hemoglobin levels below nine, they were classed as having severe anemia or hypochromemia. The incidence of respiratory ailments and other childhood illnesses was high during the initial stages of the project and substantially hindered the experimental group's participation in tutorial sessions.

McGuire and White (1955) estimate social class under the categories of upper-class, upper-middle, lower-middle, upper-lower, and lower-lower. Range of scores for the 30 subjects included in the present study rated the subjects as "lower middle" (48) to "lower low" (84). Mean score was 69.5 (lower-low) for the 14 experimental subjects, and 73.6 (lower-low) for the 14 control subjects.

A description of the homes and parents is furnished by a review of the ratings on Caldwell's Assessment of Home Stimulation. Living conditions frequently were crowded. Eighteen of the subjects came from families of six or more. All but 3 of the 28 subjects resided in homes which provided 150 square feet or less of living space per person. Thirteen children had homes with less than 100 square feet per person. Seven of the homes were rated as clean and well kept; seven maintained a surface cleanliness, five were ill-kept, four dirty, and six filthy and unsanitary.

Matriarchal family patterns were characteristic. Only 7 of the 29 sets of parents were married and living together at the time of the interview. In all other cases the parent responsible for the child was the mother. In one instance the spouse was deceased; nine mothers were separated from their husbands, and one was divorced; eleven were unmarried. Generally the mother had opportunity to be with the child the major portion of the time. Twelve of the mothers were unemployed; six engaged in seasonal part-time work; seven, in regular part-time work; and three worked forty hours a week.

Characteristic of the homes was the lack of children's equipment. Both books and toys which were appropriate for the child's age level were used in only six of the twenty-nine homes. Nine homes had toys but no books. In two homes toys were available but seldom used; while twelve homes had very few or poorly chosen toys, and one home had none.

Means and inter-rater reliabilities for the experimental and control groups on the seventeen variables assessed by Fels Parent Behavior Rating Scales are set forth in Table 2. Provision was made for scores which ranged from 0 to 90, with the higher ratings being the more positive ones.

Review of individual ratings revealed that extreme scores tended to be negative (low) rather than positive (high). Perusal of ratings for all thirty subjects on the 17 variables disclosed only seven ratings of 70 or above versus 44 ratings of 20 or below. Noteworthy attitudes common to these homes appeared when consideration was given the six variables which received lowest mean ratings and the two which received highest mean ratings. These homes in general were characterized by lack of restrictiveness. Standards and regulations tended to be liberal and freedom was allowed in matters commonly subject to regimentation. When the parent did recognize misconduct the penalties often were too mild to have motivating power. The age of the subjects probably influenced the parents' tendency to disregard misconduct, to omit explanation regarding requirements and penalties, and to avoid deliberate training of the child in mental and motor skills. However, these same attitudes were maintained in the parents' interaction with older siblings. Most attempts were restrained on occasion, and in some instances there was a complete lack of deliberate training. Nonetheless, attempts at self-help usually were not discouraged and conditions of general babying or overprotectiveness seldom existed. The tendency was to withhold aid as the child sought solutions for minor problems. Although understanding of the child's needs and capacities (functional parental intelligence) was limited, these parents were affectionate, and in most instances a psychological closeness characterized the mother-child relationship. Extreme hostility or open rejection by the mother for the child was not found. Although child neglect was

Table 2

Fels Parent Behavior Rating Scales: Mean Ratings for Experimental and Control Groups and Inter-Rater Reliability

Variable	Experimental N=15	Control N=15	Inter-Rater Reliability
1. Adjustment of Home	41	40	.86
2. Restrictiveness of Regulations	41	37	.73
3. Severity of Penalties	40	33	.78
4. Clarity of Policy	45	42	.69
5. Coerciveness of Suggestion	47	35	.80
6. Accelerational Attempt	31	32	.71
7. General Babying	38	38	.80
8. General Protectiveness	42	39	.88
9. Direction of Criticism	38	43	.82
10. Affectionateness	52	50	.71
11. Child-Centeredness of Home	38	41	.80
12. Duration of Contact	43	49	.89
13. Intensity of Contact	45	46	.90
14. Justification of Disciplinary Policy	34	39	.77
15. Readiness of Explanation	41	46	.76
16. Understanding	34	37	.93
17. Rapport between Parent and Child	50	52	.85

noted in two cases there was no suggestion of child abuse in any of the homes.

Development of Tutorial Program

Because each of the fifteen experimental subjects was found to be proceeding normally in motor development, the initial phase of the program, while essentially sensory-motor, emphasized eight areas of cognitive development: (1) language, (2) symbolic representation, (3) space, (4) number, (5) classification, (6) time, (7) reasoning, and (8) imitation. After an initial exploratory period, tasks designed to promote learning in these areas were organized on the basis of a developmental sequence. Work on symbolic representation is here cited to illustrate techniques utilized in the tutoring program.

Initially pictures had no interest or meaning for the majority of these subjects. Attention centered on the manipulative value of the paper and scant heed was given the picture. In an effort to promote interest and recognition, life-sized, realistically colored pictures were selected which represented objects found in the child's daily environment. When these were presented, the children continued to evince no sign of recognition. Therefore, a decision was made to present realistic pictures of oranges while the tutor and subject were engaged in peeling and eating an orange. The task required the child to put half of the orange in an envelope to which a picture of half an orange was attached. Later an apple and an envelope with an attached picture of an apple replaced the orange. Still later envelopes for both the apple and the orange were placed in front of the child and he was requested to "put the orange in the bag," or "put the apple in the bag." Correct placement was made using the pictured orange or apple as the cue. As bananas, peaches, and other fruits were introduced, it became necessary for the child to discriminate between four pictured objects to achieve correct placement. Following this, the task was expanded to include such everyday objects (and their envelope picture) as bottle, shoe, sock, and comb. After success was achieved in this activity, the child identified these same items in picture books. In this manner the transition from concrete object to pictorial representation was made, and nursery books which contained these pictured items began to have interest and meaning for these culturally disadvantaged subjects. Thus the tutorial approach for the eight cognitive areas consisted of (1) locating the child developmentally in a particular area, (2) devising methods which would aid transition from one developmental level to the next, and (3) dividing the training task into a sequence of activities. The tutorial program is described in detail in Painter (1968).

The Second-Year Program

At the conclusion of one year's tutoring, the fourteen experimental children were placed in a half-day preschool for a seven-month period. The program provided was similar to the first year of the program described by Karnes in this report (Earlier Intervention: Effects of the Ameliorative Program Initiated with Three-Year-Old Children and Maintained for Two Years).

RESULTS AND DISCUSSION

The results of this experiment compare the experimental group of fourteen children who received one year of tutoring at home the first year and in the second year attended the Ameliorative preschool where a structured program was provided for two hours a day with a control group of similar disadvantaged children who did not receive early education for the two-year period. The two groups are also compared to their older siblings who were examined at the age of four before receiving preschool education. The two major methods of measurement of progress at this time are the Stanford-Binet (Form L-M) and the Illinois Test of Psycholinguistic Abilities, the latter given only at the end of the experiment.

Changes in Rate of Mental Development

Figure 2 presents a comparison of the changes in intelligence quotients of the experimental and control groups over the two-year period.

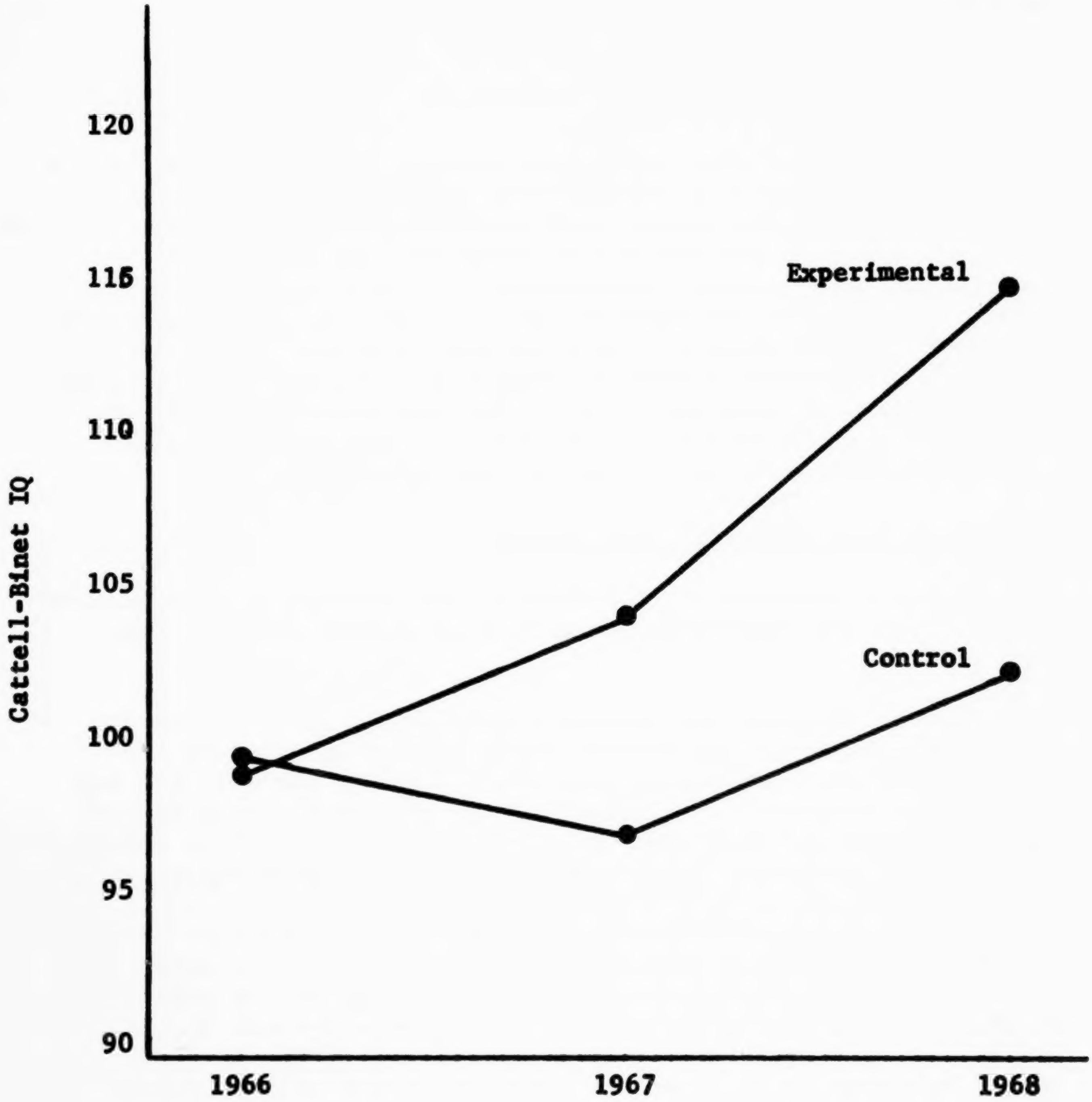
The experimental and control children had IQ's of 98.9 and 99.2 respectively on the Cattell Scale of Intelligence at the beginning of the experiment, when their average age was 16.9 and 17.0 months respectively (Table 1). The only difference between the groups was the fact that the experimental group of 14 children had 12 Negro children, while the control group had 8 Negro children.

It will be noted from Figure 2 that the experimental group gained approximately 5 points in IQ during the year in which they had tutoring at home for one hour a day, and gained an additional 11 points in IQ the second year when they were trained in the structured Ameliorative program. The Control group, on the other hand, decreased in IQ from 99.2 to 96.9, a drop of 2 IQ points during the first year. The second year, while they were still at home, they advanced to an IQ of 102, or an increase of approximately 5 IQ points.

These comparisons should be made with caution. The first IQ was obtained on the Cattell test, whereas the second and third test scores were obtained on the Stanford-Binet. Consequently, it is questionable whether direct comparisons can be made. The

Figure 2

A Comparison of IQ Changes for the Experimental and Control Groups over a Two-Year Period



Cattell test was administered to determine whether the groups selected were equal in age and measured intelligence. The direct comparison that can be made, therefore, is a comparison of the groups at different time intervals, rather than a comparison over time on tests that are questionably comparable.

Although the control group nominally stayed at home, a follow-up showed that three of the 14 control children attended a day school and Head Start during the second year. These children increased their IQ's during the year by 9, 11, and 17 points, thus inflating the increase made by the control group as a whole. Subtracting these three scores from the group, the mean increase of the remaining children was only 3 points.

The statistical analysis shown in Table 3 suggests several generalizations.

1. The experimental and control subjects had no significant differences in age and IQ at the beginning of the experiment.

2. When tested on the Stanford-Binet after one year of tutoring, the Experimental group had a mean IQ of 104, while the control subjects had a mean IQ of 97, a difference of 7 IQ points between the two groups. This was statistically significant at the .05 level.

3. After one year of group instruction in a preschool for three-year-olds, the experimental children obtained a mean IQ of 115, while the control children obtained a mean IQ of 102, a difference of 13 IQ points. This was statistically significant at the .005 level, in spite of the fact that three of the control children attended a preschool during the year and showed an average increase in IQ of 12 points, thus inflating the gains made by the control group as a whole. Without these three, the increase of the control group was only 3 IQ points.

As was noted, the difference between the groups after one year of tutoring in the home was 7 points. Although this is statistically significant, there is always the question of whether this difference has psychological significance. Ordinarily, spurts in IQ come during the initial stages of instruction with a plateau or only slight increase the second year. The results here are the reverse. The second year's instruction in a group showed a wider difference than that of the first year.

Preschool results for the three-year-old experimental group are similar to those obtained by Karnes, Hodgins, Stoneburner, Studley, and Teska (1968) during the first year of a two-year study with three-year-olds. Her preschool group gained 17 points, whereas her control group lost 3 points.

Table 3

A Comparison of Pre- and Posttests for Experimental and Control Groups

	Pretest Cattell		Test after 1 year Binet		Test after 2 years Binet	
	Exp.	Cont.	Exp.	Cont.	Exp.	Cont.
Mean	98.9	99.2	104.0	96.9*	114.9	102.0
Variance	45.78	69.02	123.71	70.78	96.26	143.71
Diff. between means	0.3		7.1		12.9	
t value	.01		1.84		3.00	
Level of significance	NS		.05**		.005**	

*Four of the control children received the Cattell, and these scores are included in this mean.

**One-tailed test.

Comparison with Siblings

One of the comparisons in which we have been interested is the possible difference between a group of children who had early training compared to their older siblings who did not receive intervention before the age of four. Since the infants in the experimental and control groups were younger siblings of children who were tested at age 4, and then admitted to the preschool, such a comparison is possible.

Table 4 presents these data for (a) the infant experimental group at average age 3-7, (b) the siblings of the experimental group at average age 4-3, (c) the infant control group at average age 3-6, and (d) the siblings of the control group at average age 4-2. There was a difference of 22.8 IQ points between the experimental children, who had intervention for 2 years between the ages of one and three and one-half, and their siblings, who were examined at age 4 and who did not have intervention. The control infants at age 3-6 who did not receive preschool intervention were 7.9 IQ points higher than their four-year-old siblings who did not receive preschool intervention. Although this difference is significant at the .05 level, it would not be significant if we deleted the 3 children who attended other preschools and whose average increase was 12 IQ points. The IQ difference would then reduce to 5 points.

Rate of Psycholinguistic Development

The Illinois Test of Psycholinguistic Abilities does not test children adequately below three years of age. Consequently, the test was not administered to the two groups at the beginning of the experiment but was administered at the end of the experiment to both groups when the children were 3-7 (experimental) and 3-6 (control) years of age. The test was administered to the older siblings at 4-3 and 4-2 years of age, respectively.

Figure 3 graphically presents the Standard Scores on the Total score of the ITPA for the four groups at the end of the experiment. It will be noted that the only group that showed a positive standard score (+.45) was the experimental group. The control group with a standard score of -.73 was 1.18 standard scores below the experimental group. Likewise, the siblings at an older age had standard scores of -.87 and -.61. Although these data present some evidence on the effects of early training, they do not furnish us information on whether the gains were the result of the one-hour-a-day of tutoring for the first year, or the group experience in the preschool the second year, or the combination of the two.

Visual Perceptual Development

In addition to the Stanford-Binet and the ITPA, comparisons were made between the experimental and control groups on the

Table 4

A Comparison of Infant Experimental and Control Groups with Older Siblings Before Training

	Infant Exp. Group	Siblings of Exp. Group	Infant Control Group	Siblings of Control Group
Stanford Binet IQ	114.9	92.1	102.0*	94.1
Variance	96.26	79.50	143.71	195.12
Difference	22.8		7.9	
t (correlated pairs of means)	5.73		2.42	
Significance	.0005**		.05***	

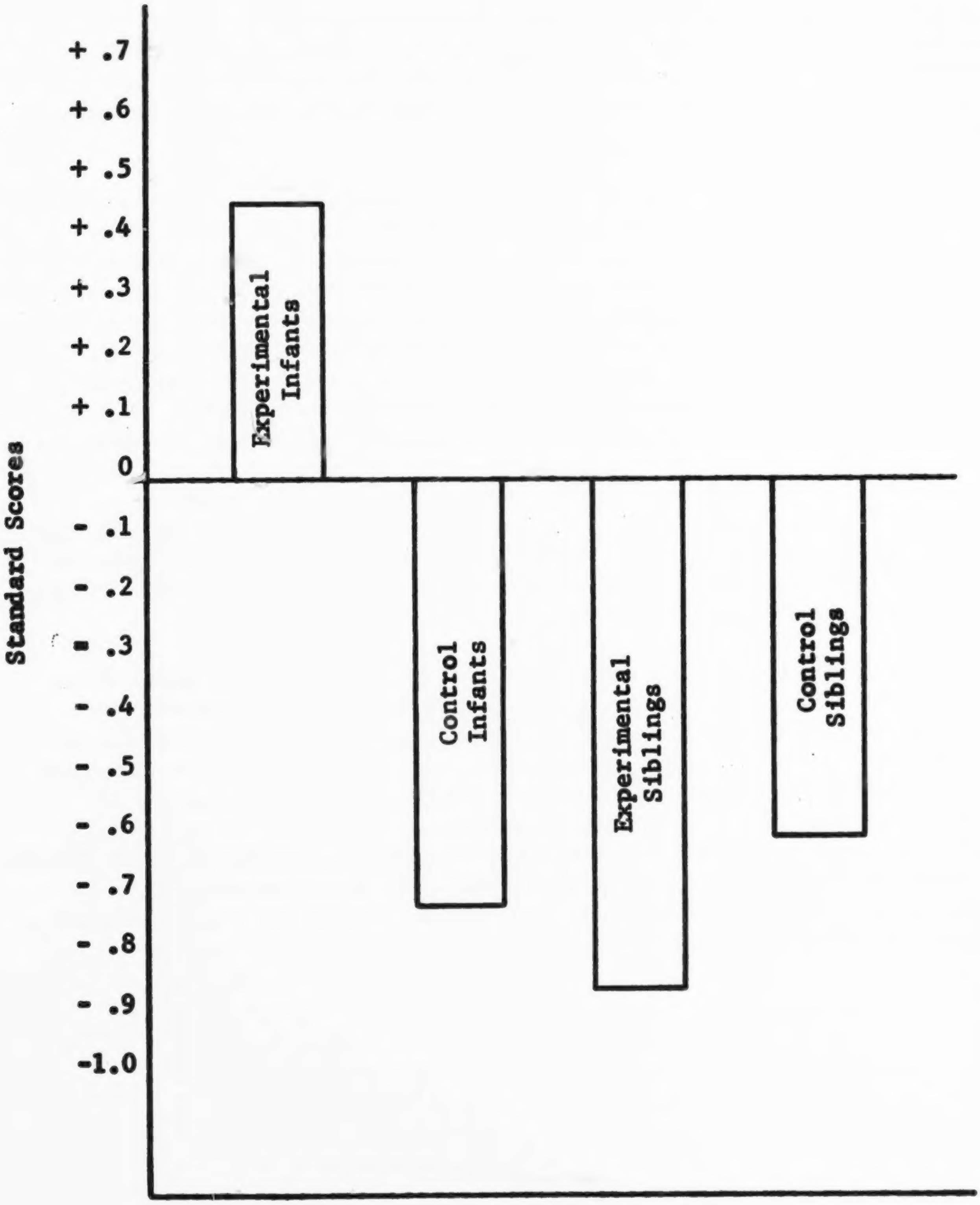
*Three of the control children received preschool education. Their increases in IQ inflated this average.

**One-tailed test

***Two-tailed test

Figure 3

A Comparison of Experimental, Control, and Sibling Groups on Total ITPA Standard Scores



Frostig Test at the end of the experiment. The experimental group obtained a perceptual quotient of 98.5, while the control group obtained 90.9. These results are similar to the favorable results obtained by the experimental group on the Stanford-Binet and ITPA.

Discussion

The results of this study indicate quite clearly that for disadvantaged children preschool intervention at age three produces significant acceleration in mental development as measured by the Stanford-Binet, the ITPA, and other tests. When compared with the development of disadvantaged children who did not receive such intervention, the results support the hypothesis that early intervention is beneficial.

The major hypothesis of this study, however, was that tutoring in the home at the ages of one to two years for one hour a day is even more beneficial than initiating intervention at the ages of four and five. Although the 7-point difference in IQ reported here between the experimental and control groups was statistically significant, the conclusion that one hour a day of tutoring is warranted seems dubious in light of the fact that the experimental group and the Karnes preschool group (who did not have home training at age two) made greater increases in IQ when entering the Ameliorative preschool at the age of three. The hypothesis, then, that home training for one hour a day before the age of three is more beneficial than training at a later age would appear to be negated. As indicated, better results were obtained by placing children at age three for one-half day in a specialized preschool with a ratio of one teacher to five children.

It should be pointed out, however, that this experiment does not exclude the possibility of obtaining marked improvement in children when intervention is initiated in the home at the age of one and two, if the intervention consists of a program in the home that includes more than one hour of tutoring plus a program of parent training and parent participation. The present writer is convinced that a little intervention is not significantly beneficial, and that if results are to be achieved, the program must be a "total push" program throughout the waking hours of a child over a four- or five-year period.

Training Mothers to Instruct Their Infants at Home

Merle B. Karnes and Earladeen Badger

Educational programs implemented by mothers for young, disadvantaged children characterized all stages of the larger research project. The pilot study (The Effects of Short-Term Instruction at Home by Mothers) begun in the first year of the project was expanded in the second year (The Impact of At-Home Instruction by Mothers on Performance in the Ameliorative Preschool) and diversified during the third year to include the training of young mothers as classroom teachers (Implementing the Ameliorative Program with Paraprofessional Staff) and, in this study, the training of mothers to implement an instructional program at home for their one- and two-year-old infants. Tutorial programs for infants such as the one described by Kirk in the preceding report (See also Painter, 1968.) require staff and budgetary commitments at impractical levels, and a more feasible tactic, based on the mother-involvement studies cited above, seemed to be the training of mothers to carry out an instructional program with their own infants at home. Such an effort, if successful, would (1) extend the number of children reached by limited professional staff with minimal budget (2) stimulate the mother's awareness of the education needs of her infant and her role in meeting these needs (3) affect positively the educational prognosis of other children in the family as the mother incorporated her training into her role as mother (4) develop a sense of dignity and worth as the mother demonstrated self-help capabilities (5) provide a setting where family problems related to school failures and disappointments but beyond the mother-infant focus could be openly discussed and (6) contribute to the training of indigenous leadership by encouraging these mothers to become involved in the agencies for educational and social change within their own community.

METHOD

Recruitment

Twenty mothers with infants between the ages of twelve and twenty-four months were recruited from the economically depressed neighborhoods of Champaign-Urbana, a community of 100,000 in central Illinois.[1] Staff workers at the offices of Aid to

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[1] The original intent had been to include a control group of twenty infants and mothers; however, an adequate number of mothers able to participate could not be recruited, and the attempt to maintain a control group was abandoned.

Dependent Children and the Public Health Department were the primary referral sources. In addition, an interviewer canvassed certain acutely disadvantaged sections of the city to locate disadvantaged families new to the community or otherwise unknown to the referring agencies. Sixteen of the twenty mothers who comprised the training group were ADC recipients. The families of the remaining four children met the OEO poverty definition acceptable for Head Start admission.

During these initial contacts, the mother was asked if she were willing to attend a two-hour class each week where she would be instructed in teaching techniques to use with her infant at home. In order to make appropriate baby-sitting arrangements for her children, she would be paid $1.50 an hour to attend these meetings. Transportation to and from the meetings would also be provided. She was asked, further, to agree to apply these teaching techniques with her infant for a period of time each day. She would not be paid for this work-time at home, but the toys used to implement the instructional program would be given to her baby. Finally, it was explained that the infant would be tested at home before and after the program to determine how successful she had been as a teacher.

Although the mothers readily acknowledged the importance of education to their children, they did not recognize their contribution to that enterprise. The suggestion that they could learn ways to stimulate the mental and language development of their babies at home was received with skepticism. Needless to add, many mothers agreed to participate in the program with only a limited commitment. Generally, it might be fair to characterize the mothers' initial acceptance of the program as follows: They wanted their children to have a better education than they had had and were favorably impressed by the educational opportunity offered their infant regardless of how inadequate they may have felt about their own participation as a "teacher."

Background of the Mothers

After enrollment had stabilized in November, the group of twenty included eighteen Negro and two Caucasian mothers. Three of the Negro women were grandmothers who were included because they assumed the primary responsibility for the infants. The two white mothers and four of the Negro mothers had been born in the North; the others had migrated from the South, principally from Mississippi but also from Georgia and Arkansas. The ages of these mothers ranged from 19 to 56 years, with a mean age of 29.4 years. Their educational levels ranged from 6 to 12 years, with a mean of 9.2 years. These mothers had from 2 to 12 children, with a mean of 4.9 children.

Public assistance through Aid to Dependent Children was the total or partial support for sixteen of the families included in this study, and the fathers were absent from all but two of these homes. Six of these mothers worked on a part-time basis (domestic day-work) to supplement ADC funds; three had stable full-time employment (a hotel maid, an aide in a nursing home, and a drug store cashier), and one attended a beauty culture school on a full-time basis. In the families of the three participating grandmothers, the mothers of the infants were full-time students. Four of the families in this study were self-supporting. Three of these families represented intact marriages. Two mothers were employed full-time; one worked a sixteen-hour day at a factory assembly-line job and an evening food service job and the other supported herself as a food caterer. With only one exception (the family in which the mother worked a sixteen-hour day) the annual income of these families did not exceed $4000.

Initial Characteristics of the Children

The mean chronological age of the twenty infants who participated in this study was nineteen months at the time of the initial intelligence test, with a range of 14 to 26 months. Nine of these subjects were female, 11 were male; 18 were Negro and two were Caucasian. The initial mean Cattell IQ of this group was 97.6, and IQ scores ranged from 79 to 120.

Intervention

To encourage discussion, the twenty mothers were divided into two groups of ten which met separately throughout the program. Two staff members conducted the weekly two-hour meetings over the seven-month period of the study. One staff member functioned as a group leader while the other served as a recorder. After the meeting, both staff members evaluated in writing the content presented and the interactions among the members of the group. In addition, they made monthly (more often when necessary) home visits to reinforce the teaching principles introduced at the meetings and to help each mother establish a positive working relationship with her baby. These visits also provided staff members an essential observation of the appropriateness of the infant curriculum as well as their success in communicating teaching strategies to the mothers. In all cases, these visits were welcomed by the mothers.

In general, the weekly meetings were divided between child- and mother-centered activities. The first category included the presentation of educational toys and materials with an appropriate teaching model and required strong staff leadership. The mother-centered activities involved group discussion directed toward child-rearing problems in today's society but was intended to foster a sense of responsibility in the mothers for themselves, their families, and the community in which they live. That portion of the meeting often involved minimal leader participation so that the group would provide its own vehicle for attitude change through interactions among the members.

Eleven educational toys were chosen as the instructional media for the intellectual and language stimulation of the infant but were, of course, equally important as the media in which a positive interaction between mother and child occurred. In addition, crayons, scissors, play dough, chalk and slate, inexpensive books, a lending library of thirty wooden in-lay puzzles, and simple object lotto games were provided. A child's table and chair and a plastic laundry basket for toy storage were supplied as conditioners of good work habits. These materials were chosen through an evaluation of those used in the earlier infant tutorial program and were selected to offer a wide range of experience in sensory-motor as well as conceptual and language development. While the books were primarily intended to encourage language interactions between mother and child, all of the program toys created opportunities for verbal development. As the leader demonstrated teaching techniques with each new toy, she used key words which the mothers were to use and which they were to encourage their children to say.

Certain principles of teaching were repeated often at the weekly meeting and encouraged during the home visits.

1. If you have a good working relationship with your child, you can become an effective teacher. A good relationship is based on mutual respect.

2. Be positive in your approach. Praise or acknowledge the child's success in each new task, even when the child simply tries to do as he is instructed. In correcting a mistake, minimize it. Show the right way immediately; have the child attempt the task again and praise him.

3. Break a task into separate steps. Teach one step at a time, starting with the simplest. Do not proceed to the next step until the child is successful with the first.

4. Introduce one toy at a time. Put one toy back in the laundry basket before presenting another. With beads or toys with many parts, use a container on the table to teach order and to prevent spills.

5. If the child does not attend or try to do as instructed (and you are absolutely sure he can do what is asked), put the toys away until later. Try again when he is ready to work. Do not scold, beg, or bribe. This time together should be fun for both of you.

The instructional program for the child developed as follows:

1. The *table and chair set and plastic laundry basket* were considered essential in encouraging organization in the home and with the child. Mothers were instructed to work with their babies at the child's table and with the child on his chair. Initially, work periods were only ten minutes but increased as the child's attention span lengthened and as the selection of toys increased.

2. Each mother collected or was given a set of five *seriated cans*. Introducing two cans, she stressed the words *big* and *little*. She taught her baby to stack, saying, "Put the little can *on top* of the big can." Then the cans were inverted: "Put the little can *in* the big one." When the child successfully performed these tasks with two cans, the mother increased the number until he was able to perform both tasks with five cans. The use of cans preceded the nested boxes which were distributed later.

3. Initially, mothers were instructed to remove the *graduated rings* from the spindle and arrange them in order on the table. The child was to place the rings on the spindle in order. When this format was followed, even the youngest baby was successful, and the graduated rings proved to be a good first toy for developing a sense of accomplishment.

4. In introducing *snap beads* the mother stood behind the child's chair, clasped her hands over his, and repeated the motions of *push* and *pull* by snapping and unsnapping the same two beads. She exaggerated this movement, repeating the key words. When the child approximated these motions, he was ready to try to snap the beads without help. Later, he had to be helped again to learn to move the hand that held the chain of beads up to the next bead.

5. Although five geometric shapes were to be placed in their proper holes in the *form box*, each mother began with the easiest shape, the circle. Calling the shape by name, she helped her child insert the circle until he could do it by himself. Other shapes were added one at a time.

(The Nested Cans, the Graduated Rings, the Snap Beads, and the Form Box were introduced during the first six meetings. The first two toys helped to develop a sense of success; the other two required patience from mother and child. Help from the mother was particularly needed with babies under twenty months of age. Since most of the babies had an attention span of less than twenty minutes at this stage of the program, four toys and two simple picture books were adequate materials for daily at-home work sessions.)

6. Stringing beads was a more difficult task than snapping beads. Mothers needed to demonstrate many times and, as with the snap beads, helped their children by standing behind their chairs. Babies under eighteen months were not ready for this toy, but most of the children were completely successful with this task between the ages of twenty and twenty-two months.

7. Masonite Shapes in various colors and sizes were presented initially to emphasize form and size. Color was not stressed, and this toy served as an extension of the form box and of the concept of big and little introduced with nested cans. Mothers were instructed to stress the words circle, square, big circle, little circle, etc. They were encouraged to improvise verbal games such as "Give me the big circle. Put the little circle in the box."

8. Only two nested boxes, big and little, were presented at first. In addition to the stacking and inverting tasks introduced with nested cans, the child learned to cover the little box with the big box, "to hide the box." Later, when working with several boxes, the mother prearranged them to insure the child's success.

(At the end of the third month of the program, older children were performing fairly successfully with all of these toys. Several were attending for as long as an hour, and the mothers were encouraged to repeat the complete program of toys daily.)

9. The pounding bench, busy box, and music ball were distributed to mothers the week before Christmas and were described as "fun toys." They were not to be kept with the program toys or played with at the table and chair; rather, the baby could play with them whenever or however he chose. Mothers who complained that their babies didn't want to stop working when they put away the toys were instructed to use the fun toys as transfer toys. The mother was to put away the program toys when she decided the session was finished and to give her baby one of the fun toys as a substitute. For those babies who valued the time with mother rather than the toys, this substitution was not very successful.

10. The lending library of thirty wooden in-lay puzzles (3-12 pieces) was initiated during the third month of the program. Mothers of younger babies kept the same puzzle for two or three weeks, but other mothers exchanged puzzles on a weekly basis.

11. During the second half of the program, language development was increasingly emphasized. Mothers received a list of antonyms with examples of how to teach them to their babies. The teaching of prepositions was demonstrated with program toys. Several simple finger plays were also taught. Books such as The Three Little Kittens and Mother Goose Nursery Rhymes stressed dramatization in story-telling. These kinds of activities were

not enthusiastically received by the mothers, perhaps because they were self-conscious about their own speech patterns, and the two white mothers provided most of the favorable response to these activities. All of the mothers, however, enjoyed teaching body parts to their babies and some were successful with as many as 10-15 parts of the body.

12. All of the babies enjoyed playing with play dough, scissors, crayons, and slate and chalk. Although these materials were offered to the child during the work period so that his mother could supervise, their use was relatively unstructured. Other than teaching their babies to make a circle by going "round and round" with a crayon on a large newspaper and with chalk on the slate, the mothers were encouraged to allow their babies to express themselves freely with these materials. Several of the older babies learned to use the scissors very well and to show control with large crayons. A home project which proved very successful in stimulating language was a picture scrapbook, a loose-leaf notebook with durable, heavy-grade paper. The mother or older children in the family cut pictures from magazines and catalogs which the baby was able to identify by naming or pointing. These pictures were pasted in the scrapbook, a source of pride and accomplishment shared by mother and child.

13. A set of 10 wooden blocks, the learning tower (5 graduated, plastic cylinders), and Unifix Cubes (10 one-half inch interlocking plastic cubes) were introduced near the end of the program to demonstrate transfer of learning to the mothers. Mothers were requested to provide no instruction and to observe the reactions of their infants when presented with these toys. In order that a staff member could also observe these reactions, these toys were distributed during a home visit. Staff and mothers were delighted to see that most of the babies stacked and inverted the plastic cylinders from the learning tower as they had the cans and boxes. They were able to join the interlocking cubes with the same skill they had acquired with the snap beads.

14. Four kinds of Object Lotto Cards were rotated during the last month of the program. The pictures on the cards were familiar to most of the babies, and the older children quickly learned to match the cards to the pictures on the large lotto card.

The mother-centered aspect of the weekly meetings was not planned by the staff alone; rather, the group response to previous material guided the selection of discussion topics. The leader was prepared to introduce a new topic at each meeting but was willing to change the agenda when a more relevant topic was brought up by one of the mothers. Among the topics which provoked meaningful discussion were child discipline, birth control, and the generation gap. On occasion, pamphlets or magazine excerpts were distributed for reading prior to discussion sessions. Several films

("Guess Who's Coming to Dinner?" and "Palmour Street") and speakers (a Black Power advocate and a family planning expert) were included as were a trip to the public library to provide cards for all mothers and to explore the resources of the children's library and a visit to a demonstration nursery school. After group identity had been established, discussion sessions were sometimes replaced with role playing. (One mother played the role of a teenage girl who wanted to quit school and get married. She came home late to find her mother and grandmother waiting up for her and announced her decision to marry. From this point, the acting members and the group as a whole explored various aspects of the generation gap.)

Evaluation Procedures

Interim data were to be collected and evaluated at the end of the first and second years (Spring, 1968; Spring, 1969). When the children reached the age of four (Spring, 1970), postdata were to be collected and the study terminated. Three major comparisons were to be made: (1) A comparison at the end of each of the three years of the study between the twenty children whose mothers had been trained to teach them at home and a comparable group whose mothers had not been provided with this training (2) A comparison at the age of three years between the children whose mothers had been trained to teach them at home and a group of middle-class children (3) A comparison between the children whose mothers had been trained to teach them at home and the infants who were tutored by professional personnel in the preceding Kirk study. Because of the termination of funding, this study continued less than a year and these longitudinal comparisons cannot be made. Since it was not possible to maintain a control group, that interim comparison cannot be made; neither can an interim comparison be made with the infants tutored professionally, since the length of tutorial intervention doubled the intervention of this study at its termination.

Initially the twenty infants were administered the Cattell Infant Intelligence Scale and were to receive the Stanford-Binet Intelligence Scale at the end of the first year of intervention. At the termination of this study (seven months), eight infants, according to the judgment of the examiner, were incapable of being tested with the Binet and were administered the Cattell. The primary intent of the initial Cattell was to match an experimental and a control group, and comparisons between test-one Cattell scores and test-two Binet scores were not considered. Assessment of children at this age is difficult and tentative at best, and these data in the absence of a control group provide little information on the development of the infants.

A more appropriate evaluation of this truncated program can be made through a consideration of the data recorded by staff members during the monthly home visits and after each weekly meeting. Data on mother participation was gathered on five variables. *Absences from the weekly meetings* were recorded. The *levels of participation at the meetings* were rated (1) exhibits leadership (2) exhibits interest but remains essentially a silent participant and (3) exhibits indifference or boredom. Mothers were rated *ego-centered* if their major concern at meetings was over personal problems rather than the educational goals of the program for their children. In an anonymous ballot mothers indicated whether they desired to participate in a consecutive, *second-year program*. The final assessment of mother participation was whether she was able to *extend the activities of the program* through innovative use of materials, through the preparation of a picture book designed to stimulate the child's labeling skills, through extending her teaching skills with other children in the family or neighborhood.

Mother-child interaction as it related to the instructional program was assessed in three areas. The *mother's teaching relationship with her child* was rated (1) to indicate a highly effective teaching relationship with appropriate positive reinforcement (2) to indicate a teaching relationship inappropriate at times (too little or too much positive reinforcement, too high or too low expectations for child performance) and (3) to indicate an essentially negative teaching relationship (difficulty in praising the child, short-tempered, inconsistent). The *interest and attention span* shown by the child working with program materials were rated during home visits. A positive rating indicated that child and mother worked agreeably with program materials for increasingly sustained periods. Finally, the child's *spontaneous verbalization* was rated as appropriate and adequate or conspicuously reduced while working with program materials.

Child performance was assessed during home visits on nine activities: snap beads, form box, string beads, masonite shapes of different colors and sizes, nested boxes, puzzles, books, identification of body parts, and picture lotto. The child was rated positively if his use of these materials was appropriate and essentially correct. Since two items (snap beads and nested boxes) were mastered by all children, they were eliminated from further consideration in evaluating differential performance.

RESULTS AND DISCUSSION

A preliminary examination of the observational data indicated that the age of the infant at the initiation of the program and whether his mother was employed full-time were of governing importance. Although working mothers were not excluded during recruitment, staff members noted early in the program that these mothers were less able to devote time and energy to attending the weekly meetings and to implementing the program's goals at home with their children. For this reason, the data for the six mothers who were employed on a full-time basis and for their children are presented separately. A further examination of the data within the group of nonworking mothers (N=14) indicated that the age of the child at the initiation of the program was of considerable importance to many of the variables assessed, and, therefore, the data for the younger children (13 - 19 months) are presented independently of the data for the older children (20 - 27 months) of nonworking mothers.[2] The smaller N of the working-mother group precluded on age categorization; further, age did not seem to be a relevant factor with this group. Certain family background characteristics were unequally distributed within these groups and may be pertinent to the results obtained. Although the mothers in the nonworking and working groups had similar educational levels, the presence of a father figure was noted more frequently in the homes of the nonworking mothers. On the other hand, the working mothers had to meet the demands of fewer children. Within the nonworking group, the older children had a substantial advantage on two of these factors: fathers were most often found in these homes and the mothers in this group had the highest educational level. These families were, however, considerably larger than either the families of the working mothers or the families of the nonworking mothers of younger children. These data as well as the observational data and the results of standardized tests are presented in Table 1.

Clearly, the participation of mothers who worked on a full-time basis outside the home was inferior in all respects to that of the mothers who were not fully employed. Their attendance was markedly poorer than that of the nonworking mothers whose commitment to program goals is perhaps best shown in the high percentage who elected to participate in a second-year program. Only 33% of the fully employed mothers voted to continue. The nonworking mothers tended to show leadership qualities and attentive interest at the weekly meetings while 50% of the working mothers appeared bored or indifferent. Concomitant with their rather negative response at meetings is the high percentage of working mothers (83%) who were rated as ego-centered or primarily concerned with personal problems rather than the educational goals of the program for their children. Several of these mothers, in fact, tended to exploit the meeting time to verbalize guilt feelings related to their inability "to give to" or "to do for" their children. Finally, only 17% of the working mothers were considered to be innovative in their use of program materials or able to extend the goals of the program through their own initiative. A rather high percentage of the nonworking mothers demonstrated an ability to extend their

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[2] Nineteen months was chosen as the cut-off point for the younger group since half of the twenty children were nineteen months or less at the initiation of the program.

Table 1

Family Background, Observational and Standardized Test Data

Variable	Working Mothers (N=6)			Nonworking Mothers (N=14)			Nonworking Mothers (N=8) Younger Infants			Nonworking Mothers (N=6) Older Infants		
Initial CA (in months)												
Range	17 - 22			13 - 27			13 - 19			20 - 27		
Mean	19.3			19.2			16.1			23.3		
FAMILY BACKGROUND												
Father figure in home	17%			50%			38%			67%		
Mean number of children	4.0			5.3			4.1			6.8		
Mean educational level of mothers	9.5			9.1			8.8			9.7		
MOTHER PARTICIPATION												
Mean absences	10.2			2.5			3.5			1.2		
Class participation												
1. Leadership	33%			21%			0%			50%		
2. Attentive	17%			64%			75%			50%		
3. Bored, indifferent	50%			14%			25%			0%		
Ego-centered	83%			21%			38%			0%		
Elect 2nd Year Program	33%			93%			88%			100%		
Extended activity	17%			50%			25%			83%		
MOTHER-CHILD INTERACTION (with program materials)												
Teaching relationship												
1. Highly effective	0%			43%			38%			50%		
2. Inappropriative at times	17%			43%			38%			50%		
3. Negative	83%			14%			25%			0%		
Child's interest	17%			86%			75%			100%		
Child's spontaneous verbalization	33%			86%			75%			100%		
CHILD PERFORMANCE: PROGRAM TASKS												
Form box: Number of forms (1-5) placed	2.3			3.5			2.6			4.7		
String beads	67%			79%			62%			100%		
Shapes, colors, sizes	33%			57%			38%			83%		
Puzzles	33%			57%			38%			83%		
Books	17%			50%			25%			83%		
Identifying body parts	50%			57%			38%			83%		
Picture lotto	33%			57%			38%			83%		
STANDARDIZED TESTS	N	IQ	CA	N	IQ	CA	N	IQ	CA	N	IQ	CA
Test-one Cattell	3	90.7	18.3	5	104.0	15.5	5	104.0	15.5			
Test-two Cattell	3	86.0	25.0	5	97.4	21.6	5	97.4	21.6			
Test-one Cattell	3	91.3	21.0	9	98.3	21.0	3	98.3	16.7	6	98.3	23.1
Test-two Binet	3	87.3	27.3	9	106.0	28.3	3	109.3	25.0	6	104.3	30.0

teaching skills. It seems fair to conclude that, in spite of verbal support of the program, the six mothers who were fully employed did not have the time or energy to implement program goals or to involve themselves in the group process at a meaningful level.

The participation ratings given to nonworking mothers of older infants were consistently higher than those assigned to nonworking mothers of younger infants. In this instance, it must be assumed that both groups of women had equal time and energy to implement these goals, and the age differences of their children at the initiation of the program may well have determined this disparity in ratings. It is altogether possible that the schedule of activities was more appropriate for the slightly older children and that a productive, rewarding situation for both mother and child was more readily attained. If the activities were somewhat less suited to the younger children, their mothers may have had greater difficulty with teaching assignments and felt less adequate as mother-teachers and program-participants. They may have sensed with considerable accuracy that the program was not immediately relevant to their infants.

The ratings on quality of mother-child interaction observed during home visits closely paralleled the participation ratings assigned to the three groups of mothers. Again, the nonworking mothers of older infants achieved the highest rating, and the attention span and spontaneous verbalization exhibited by the infants in this group was remarkable. The performance of nonworking mothers with younger infants closely followed while that of the working mothers and their infants was markedly inferior. All but one of the six working mothers exhibited an essentially negative teaching relationship. Again, working mothers, regardless of their good intentions, may have been so pressed by family and home responsibilities that they found it difficult to be consistent and patient with their infants.

The observational data from the third category, child performance on program tasks, generally support the data from the other two categories. Performance on these tasks by the children of working mothers uniformly fell below that of the children of mothers who were not employed on a full-time basis outside the home. Their performance, in fact, was no better than that of the younger infants of nonworking mothers. The mean CA of the children of working mothers was, in fact, three months greater, a factor which should have been a considerable asset on many of these tasks.

The data from standardized measures of intelligence tend to confirm the implications of the observational data. The children of working mothers scored 9 IQ points lower on the initial Cattell than the children of nonworking mothers. The test-two Binet scores reflect a similar ranking, and these children again scored lower, 19 points below the children of nonworking mothers. The older children of nonworking mothers ranked second on the post-Binet while the younger children of nonworking mothers scored highest on the initial Cattell and on the post-Binet. (The loss in IQ of the five younger children posttested by the Cattell is not supported by other data.)

CONCLUSIONS

Although no substantial conclusions can be drawn from the information provided by the standardized instruments or the observational ratings, certain factors may have had governing importance within employment and age categories. Mothers who worked full-time were not active program participants at meetings or at home. The teaching relationships they established with their infants were inferior and their children generally did less well on program tasks. Finally, on the initial Cattell and on the post-Binet these children ranked lower than the children of nonworking mothers.

The younger children of nonworking mothers scored highest on the initial Cattell and on the post-Binet, and, in spite of their lower CA, did as well on program tasks as the somewhat older children of working mothers. The level of mother participation and the quality of mother-child interaction for this group was clearly superior to that of the working mothers but clearly inferior to that of the nonworking mothers with older infants, a discrepancy which may relate to the developmental nature of the program tasks.

The older children and their nonworking mothers demonstrated the superior performance on all evaluations except the post-Binet where these children ranked second. The high level of participation of these mothers and their commitment to program goals was clearly indicated by their remarkable attendance record, their ability to extend teaching skills in innovative ways, and their 100% endorsement of a second-year program. Their teaching effectiveness is reflected in the interest shown by their children in program materials, in their spontaneous verbalization, and in their consistent mastery of program tasks. It must be acknowledged that this group more often had fathers at home and the highest educational level for mothers. There were, however, more children in these families to compete for the time and attention of the mothers.

The tentative conclusions drawn regarding the effectiveness of this program in training mothers to teach their infants at home suggest several implications for future investigations in this area. In general, mothers employed on a full-time basis outside the home cannot effectively participate, and their children may be better served through day-care placement. The age of the child at the initiation of the program may well be crucial to his progress as well as to the participation level of his mother. Grouping mothers according to the ages of their children within rather narrow limits (three to four months, perhaps) seems essential if appropriate materials are to be chosen and if effective procedures are to be followed. Such closely defined groupings should improve the quality of the at-home instructional program as well as the nature of the group interaction at weekly meetings.

Acknowledging the paucity of "hard" data obtained during the brief interval of this study and recognizing the potential charge of sentimentality, the staff who implemented this program have provided a selection of comments supplied by the mother participants to an "objective" interviewer (a staff member not affiliated with this program) at the final meeting. The responses of ten of the twenty mothers follow:

> I wish they'd had this program when the rest of my kids was coming up.
>
> They should keep the program all the time for other babies. Mothers in this should not stop but keep on doing this with this child and their others to come.
>
> It's been good for the whole family. He's learned the value of things he has to take care of. He follows directions from others too. It's already helping my newest baby. I don't just leave him to play alone now.
>
> The program has changed our whole house. It looks like I have more time. It makes you think more.
>
> Sometimes neighbor children come over and I teach them. I go to other homes to teach mothers how to play with their children. Now some of them can string beads and things. It seems like when someone comes, my boy wants to show them how to do things with the toys.
>
> I have enjoyed it very much. It has helped me and him. He has enjoyed it. It makes him more happy. I learned a lot of things I could teach him.
>
> It helped me a lot. It helped me to learn a lot about my child that I didn't know....how to handle her when she can't have her own way. Usually I'd give in. Now, with the toys, I don't give in. It's taught her she can't always have her own way.

> I learned quite a bit. It should continue. I have nine children and it's helped me know how to help them.
>
> It has changed Cynthia. She was real stubborn. Now she behaves better. She used to be afraid of the teacher. Now she likes her.
>
> It has changed me. I din't use to take up much time with my children, talking to them, or taking them places. Now I take them to the parks and to church. We have a lot of fun.

These comments suggest that this pilot endeavor did indeed foster attitude change, develop self-help skills, and promote a feeling of dignity and worth in the mother-participants. Surely these changes would extend from mother to child. If alteration in the organization and direction within the home can be achieved through training programs involving the mothers of infants, the ghetto child will be given the background of experiences which prepares him for the educational and thereby the economic opportunities of a democratic culture.

Appendix A

Stanford-Binet Mean IQ by Race and Sex
Five Groups for One Year

Group	N	Test 1				diff.				Test 2			
		Cau. Male	Negro Male	Cau. Female	Negro Female	Cau. Male	Negro Male	Cau. Female	Negro Female	Cau. Male	Negro Male	Cau. Female	Negro Female
T	25	94.4 (5)*	90.7 (10)	103.8 (4)	94.3 (6)	8.8	10.3	12.4	1.4	103.2	101.0	116.2	95.7
C-I	16	105.5 (2)	84.6 (5)	95.0 (3)	95.7 (6)	-3.0	3.4	12.7	5.5	102.5	88.0	107.7	101.2
M	13	93.5 (2)	89.2 (6)	90.5 (2)	103.7 (3)	9.0	7.8	12.0	-1.7	102.5	97.0	102.5	102.0
A	24	97.2 (4)	91.1 (7)	109.0 (3)	95.5 (10)	14.0	13.9	12.3	14.2	111.2	105.0	121.3	109.7
DV	23	92.5 (2)	98.6 (7)	97.4 (5)	90.3 (9)	19.0	11.5	10.4	14.4	111.5	110.1	107.8	104.7

*The number of children in each race-sex category is reported in the parentheses following test-one data. A discussion of differential effects of programs based on data in this table is inappropriate because of the small numbers of children in these categories.

Appendix B

Stanford-Binet Mean IQ by Race and Sex
Five Groups for Two Years

Group	N	Test 1				diff.				Test 3			
		Cau. Male	Negro Male	Cau. Female	Negro Female	Cau. Male	Negro Male	Cau. Female	Negro Female	Cau. Male	Negro Male	Cau. Female	Negro Female
T	25	94.4 (5)*	90.7 (10)	103.8 (4)	94.3 (6)	6.2	7.7	3.4	2.9	100.6	98.4	107.2	97.2
C-I	16	105.5 (2)	84.6 (5)	95.0 (3)	95.7 (6)	4.5	6.0	6.3	6.0	110.0	90.6	101.3	101.7
M	13	93.5 (2)	89.2 (6)	90.5 (2)	103.7 (3)	2.5	10.3	13.0	1.0	96.0	99.5	103.5	104.7
A	24	97.2 (4)	91.1 (7)	109.0 (3)	95.5 (10)	13.8	8.5	7.0	6.0	111.0	99.6	116.0	101.5
DV	23	92.5 (2)	98.6 (7)	97.4 (5)	90.3 (9)	21.0	22.5	15.6	17.8	113.5	121.1	113.0	108.1

*The number of children in each race-sex category is reported in the parenthesis following test-one data. A discussion of differential effects of programs based on data in this table is inappropriate because of the small numbers of children in these categories.

Appendix C

Traditional, Ameliorative, and Direct Verbal Groups Results at the End of the Preschool Year

Tables 1 - 18

RESULTS AT THE END OF THE PRESCHOOL YEAR

Statistical treatment of the total battery data (Binet, ITPA total, Peabody, Frostig, and Metropolitan) employed a multivariate analysis of covariance using initial Binet, ITPA total, Peabody, and Frostig scores as covariates. Since the Metropolitan was not given until the end of the first year, scores from this instrument were not available for use as covariates. A separate multivariate analysis of covariance of ITPA subtest data used the initial scores from the nine subtests as covariates. When multivariate F's were significant, Newman-Keuls tests at the .05 level were conducted in those instances when univariate F's were also significant.

Table 1

Total Battery Multivariate Analysis of Covariance
Three Groups for One Year

F ratio for multivariate test of equality of mean vectors = 4.4055

df = 12 and 94 P less than .0001

Variable	Between Mean Square	Univariate F	P less than
Binet IQ	185.0475	5.0996	.0095
Peabody IQ	201.6535	1.1704	.3183
Frostig PQ	881.6445	6.8833	.0023
Metropolitan Reading Readiness Raw Score	86.1777	1.7700	.1805
Metropolitan Number Readiness Raw Score	140.9983	10.9962	.0002
ITPA Total Language Age Difference Score*	30.3042	1.2533	.2941

NOTE: Initial Binet IQ, Peabody IQ, Frostig PQ, and ITPA total language age difference score (in months) were used as covariates.

*To relate language age to chronological age, a difference score (in months) was computed by subtracting a child's chronological age at the time of testing from his language age.

Table 2

Stanford-Binet Mean IQ
Three Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	94.4	8.2	102.6	-7.16
Ameliorative	24	96.2	13.8	110.0	-2.65
Direct Verbal	10	96.6	13.7	110.3	-1.03

NOTE: Initial Binet IQ, Peabody IQ, Frostig PQ, and ITPA total language age difference score (in months) were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	T	A	DV
	-7.16	-2.65	-1.03

Differences

		A	DV
T		4.51*	6.13*
A			1.62
Table Value		2.84	3.41
Corrected Table Value		4.21	5.05

$\sqrt{MS_{\text{within}}/\text{harmonic mean}} = 1.482$

*Significant difference at .05 level

Summary: The Direct Verbal and Ameliorative groups, which did not differ significantly from each other, were significantly higher than the Traditional group.

Table 3

Peabody Mean IQ
Three Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	79.8	12.7	92.5	31.65
Ameliorative	24	85.0	10.9	95.9	32.25
Direct Verbal	10	82.3	4.5	86.8	24.88

NOTE: Initial Binet IQ, Peabody IQ, Frostig PQ, and ITPA total language age difference score (in months) were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

Table 4

Frostig Mean PQ
Three Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	76.8	8.1	84.9	22.36
Ameliorative	24	81.1	18.5	99.6	34.68
Direct Verbal	10	75.9	15.6	91.5	28.79

NOTE: Initial Binet IQ, Peabody IQ, Frostig PQ, and ITPA total language age difference score (in months) were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	T	DV	A
	22.36	28.79	34.68

Differences

T		6.43	12.32*
DV			5.89
Table Value		2.84	3.41
Corrected Table Value		7.91	9.50

$\sqrt{MS_{\text{within}}/\text{harmonic mean}} = 2.785$

*Significant difference at .05 level

Summary:

1. The Ameliorative group was significantly higher than the Traditional group but not significantly higher than the Direct Verbal group.
2. The Direct Verbal and Traditional groups did not differ significantly from each other.

Table 5

Metropolitan Reading Readiness Mean Raw Score
Three Groups for One Year

Group	N	Test 2	Covaried Mean
Traditional	25	36.6	-18.13
Ameliorative	24	40.6	-15.73
Direct Verbal	10	35.3	-20.66

NOTE: Initial Binet IQ, Peabody IQ, Frostig PQ, and ITPA total language age difference score (in months) were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

Table 6

Metropolitan Number Readiness Mean Raw Score
Three Groups for One Year

Group	N	Test 2	Covaried Mean
Traditional	25	5.9	-19.56
Ameliorative	24	10.8	-15.46
Direct Verbal	10	11.5	-14.40

NOTE: Initial Binet IQ, Peabody IQ, Frostig PQ, and ITPA total language age difference score (in months) were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	T -19.56	A -15.46	DV -14.40
Differences			
T		4.10*	5.16*
A			1.06
Table Value		2.84	3.41
Corrected Table Value		2.50	3.00

$\sqrt{MS_{\text{within}}/\text{harmonic mean}} = .881$

*Significant difference at .05 level

Summary: The Direct Verbal and Ameliorative groups, which did not differ significantly from each other, were significantly higher than the Traditional group.

Table 7

ITPA Total
Mean Language Age Difference Score in Months
Three Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	-5.4	4.3	-1.1	42.55
Ameliorative	24	-3.7	6.3	2.6	44.84
Direct Verbal	10	-4.1	4.9	.8	43.51

NOTE: Initial Binet IQ, Peabody IQ, Frostig PQ, and ITPA total language age difference score (in months) were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

Table 8

ITPA Subtest Multivariate Analysis of Covariance
Three Groups for One Year

F ratio for multivariate test of equality
of mean vectors = 2.5644

df = 18 and 78 P less than .0023

Variable	Between Mean Square	Univariate F	P less than
Auditory-Vocal Automatic	159.5733	1.2508	.2957
Visual Decoding	270.7829	1.1947	.3119
Motor Encoding	465.8871	2.3209	.1094
Auditory-Vocal Association	305.9585	5.9433	.0050
Visual-Motor Sequencing	88.3063	.7281	.4883
Vocal Encoding	213.9001	1.4850	.2370
Auditory-Vocal Sequencing	31.3883	.2605	.7718
Visual-Motor Association	1654.1558	12.4243	.0001
Auditory Decoding	131.2965	.7036	.5000

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

Table 9

Auditory-Vocal Automatic Test
Mean Language Age Difference Score in Months
Three Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	- 8.4	4.0	-4.4	-25.87
Ameliorative	24	-12.1	12.4	.3	-19.70
Direct Verbal	10	-12.6	7.3	-5.3	-25.08

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

Table 10

Visual Decoding
Mean Language Age Difference Score in Months
Three Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	-1.3	3.7	2.4	85.54
Ameliorative	24	- .6	11.6	11.0	94.13
Direct Verbal	10	3.5	2.8	6.3	89.11

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

Table 11

Motor Encoding Test
Mean Language Age Difference Score in Months
Three Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	-1.6	3.8	2.2	33.86
Ameliorative	24	-8.2	8.3	.1	33.81
Direct Verbal	10	-6.8	.5	-6.3	22.59

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

Table 12

Auditory-Vocal Association Test
Mean Language Age Difference Score in Months
Three Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	-6.1	1.7	-4.4	8.93
Ameliorative	24	-5.9	6.5	.6	12.15
Direct Verbal	10	-6.9	13.9	7.0	19.13

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	T 8.93	A 12.15	DV 19.13

Differences

T		3.22	10.20*
A			6.98*
Table Value		2.84	3.41
Corrected Table Value		5.02	6.02

$\sqrt{MS_{\text{within/harmonic mean}}} = 1.766$

*Significant difference at .05 level

Summary: The Direct Verbal group was significantly higher than the Ameliorative and Traditional groups which did not differ significantly from each other.

Table 13

Visual-Motor Sequencing Test
Mean Language Age Difference Score in Months
Three Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	-10.8	8.7	-2.1	80.06
Ameliorative	24	- 7.7	9.1	1.4	79.99
Direct Verbal	10	-5.4	.6	-4.8	75.13

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

Table 14

Vocal Encoding Test
Mean Language Age Difference Score in Months
Three Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	-15.1	10.8	-4.3	57.96
Ameliorative	24	-14.7	11.7	-3.0	63.82
Direct Verbal	10	-13.8	7.0	-6.8	56.05

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

Table 15

Auditory-Vocal Sequencing Test
Mean Language Age Difference Score in Months
Three Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	2.5	- .3	2.2	-5.69
Ameliorative	24	1.6	4.9	6.5	-2.80
Direct Verbal	10	2.3	1.5	3.8	-3.64

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

Table 16

Visual-Motor Association Test
Mean Language Age Difference Score in Months
Three Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	- 2.6	.9	- 1.7	83.75
Ameliorative	24	10.9	- .9	10.0	104.83
Direct Verbal	10	- .7	3.7	3.0	91.33

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	T 83.75	DV 91.33	A 104.83
Differences			
T		7.58	21.08*
DV			13.50*
Table Value		2.84	3.41
Corrected Table Value		8.07	9.68

$\sqrt{MS_{within}/\text{harmonic mean}} = 2.840$

*Significant difference at .05 level

Summary: The Ameliorative group was significantly higher than the Direct Verbal and Traditional groups which did not differ significantly from each other.

Table 17

Auditory Decoding Test
Mean Language Age Difference Score in Months
Three Groups for One Year

Group	N	Test 1	diff.	Test 2	Covaried Mean
Traditional	25	-4.5	5.5	1.0	67.05
Ameliorative	24	2.0	.0	2.0	65.86
Direct Verbal	10	1.2	8.2	9.4	72.29

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

Table 18

Discriminant Analysis
ITPA Subtests
Three Groups for One Year

Variable	Raw coefficient 1	Raw coefficient 2
Auditory-Vocal Automatic	- .011803	.008846
Visual Decoding	- .018421	- .011414
Motor Encoding	- .024548	.028838
Auditory-Vocal Association	.079966	- .091842
Visual-Motor Sequencing	- .005782	.020653
Vocal Encoding	- .019338	.004486
Auditory-Vocal Sequencing	.003752	- .026932
Visual-Motor Association	- .072919	- .036823
Auditory Decoding	.015982	- .020990
Percent of Canonical Variation	62.29	37.71

Bartlett's Chi Square Test for Significance of Successive Canonical Variates

For roots 1-2 Chi Square = 39.9781 with 18 df P less than .0022
For roots 2-2 Chi Square = 16.0207 with 8 df P less than .0421

Discriminant Functions

	1	2
Traditional	- 5.464	-12.203
Ameliorative	- 6.093	-13.261
Direct Verbal	- 4.545	-14.001

Appendix D

Traditional, Ameliorative, and Direct Verbal Groups Results at the End of the Kindergarten Year

Tables 1 - 17

RESULTS AT THE END OF THE KINDERGARTEN YEAR

Statistical treatment of the total battery data (Binet, ITPA total, Peabody, Frostig, and Metropolitan) employed a multivariate analysis of covariance using initial Binet, ITPA total, Peabody, and Frostig scores as covariates. Since the Metropolitan was not given until the end of the first year, scores from this instrument were not available for use as covariates. A separate multivariate analysis of covariance of ITPA subtest data used the initial scores from the nine subtests as covariates. When multivariate F's were significant, Newman-Keuls tests at the .05 level were conducted in those instances when univariate F's were also significant.

Table 1

Total Battery Multivariate Analysis of Covariance
Three Groups for Two Years

F ratio for multivariate test of equality of mean vectors = 9.9011

df = 12 and 94 P less than .0001

Variable	Between Mean Square	Univariate F	P less than
Binet IQ	1217.6802	17.4776	.0001
Peabody IQ	70.8813	.3321	.7190
Frostig PQ	1918.4859	17.1497	.0001
Metropolitan Reading Readiness Raw Score	321.8624	11.3006	.0001
Metropolitan Number Readiness Raw Score	426.7464	31.0530	.0001
ITPA Total Language Age Difference Score*	145.9794	4.2439	.0197

NOTE: Initial Binet IQ, Peabody IQ, Frostig PQ, and ITPA total language age difference score (in months) were used as covariates.

*To relate language age to chronological age, a difference score (in months) was computed by subtracting a child's chronological age at the time of testing from his language age.

Table 2

Stanford-Binet Mean IQ
Three Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	94.4	5.6	100.0	-24.24
Ameliorative	24	96.2	12.4	108.6	-18.43
Direct Verbal	10	96.6	24.0	120.6	- 5.66

NOTE: Initial Binet IQ, Peabody IQ, Frostig PQ, and ITPA total language age difference score (in months) were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	T -24.24	A -18.43	DV - 5.66
		Differences	
T		5.81	18.58*
A			12.77*
Table Value		2.84	3.41
Corrected Table Value		5.83	7.00

$\sqrt{MS_{\text{within/harmonic mean}}} = 2.054$

*Significant difference at .05 level

Summary: The Direct Verbal group was significantly higher than the Ameliorative and Traditional groups which did not differ significantly from each other.

Table 3

Peabody Mean IQ
Three Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	79.8	20.3	100.1	58.37
Ameliorative	24	85.0	14.0	99.0	55.04
Direct Verbal	10	82.3	16.6	98.9	55.58

NOTE: Initial Binet IQ, Peabody IQ, Frostig PQ, and ITPA total language age difference score (in months) were used as covariates.

A Newman-Keuls test was not conducted because the univariate F was nonsignificant.

Table 4

Frostig Mean PQ
Three Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	76.8	5.9	82.7	40.90
Ameliorative	24	81.1	20.1	101.2	57.56
Direct Verbal	10	75.9	23.0	98.9	57.32

NOTE: Initial Binet IQ, Peabody IQ, Frostig PQ, and ITPA total language age difference score (in months) were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	T	DV	A
	40.90	57.32	57.56

Differences

T		16.42*	16.66*
DV			.24
Table Value		2.84	3.41
Corrected Table Value		7.39	8.88

$\sqrt{MS_{\text{within}}/\text{harmonic mean}} = 2.603$

*Significant difference at .05 level

Summary: The Ameliorative and Direct Verbal groups, which did not differ significantly from each other, were significantly higher than the Traditional group.

Table 5

Metropolitan Reading Readiness Mean Raw Score
Three Groups for Two Years

Group	N	Test 3	Covaried Mean
Traditional	25	48.4	13.76
Ameliorative	24	56.5	21.14
Direct Verbal	10	53.9	18.45

NOTE: Initial Binet IQ, Peabody IQ, Frostig PQ, and ITPA total language age difference score (in months) were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	T	DV	A
	13.76	18.45	21.14

Differences

		DV	A
T		4.69*	7.38*
DV			2.69
Table Value		2.84	3.41
Corrected Table		3.73	4.48

$\sqrt{MS_{\text{within}}/\text{harmonic mean}} = 1.313$

*Significant difference at .05 level

Summary: The Ameliorative and Direct Verbal groups, which did not differ significantly from each other, were significantly higher than the Traditional group.

Table 6

Metropolitan Number Readiness Mean Raw Score
Three Groups for Two Years

Group	N	Test 3	Covaried Mean
Traditional	25	12.8	-4.90
Ameliorative	24	21.0	3.18
Direct Verbal	10	20.5	2.26

NOTE: Initial Binet IQ, Peabody IQ, Frostig PQ, and ITPA total language age difference score (in months) were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	T	DV	A
	-4.90	2.26	3.18

Differences

T		7.16*	8.08*
DV			.92
Table Value		2.84	3.41
Corrected Table Value		2.59	3.11

$\sqrt{MS_{\text{within}}/\text{harmonic mean}} = .912$

*Significant difference at .05 level

Summary: The Ameliorative and Direct Verbal groups, which did not differ significantly from each other, were significantly higher than the Traditional group.

Table 7

ITPA Total
Mean Language Age Difference Score in Months
Three Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	-5.4	.7	-4.7	21.81
Ameliorative	24	-3.7	1.3	-2.4	21.99
Direct Verbal	10	-4.1	6.7	2.6	27.91

NOTE: Initial Binet IQ, Peabody IQ, Frostig PQ, and ITPA total language age difference score (in months) were used as covariates.

NEWMAN-KEULS PROCEDURE

Covaried Means

Group	T	A	DV
	21.81	21.99	27.91

Differences

T		.18	6.10*
A			5.92*
Table Value		2.84	3.41
Corrected Table Value		4.10	4.92

$\sqrt{MS_{\text{within/harmonic mean}}} = 1.443$

*Significant difference at .05 level

Summary: The Direct Verbal group was significantly higher than the Ameliorative and Traditional groups which did not differ significantly from each other.

Table 8

ITPA Subtest Multivariate Analysis of Covariance
Three Groups for Two Years

F ratio for multivariate test of equality
of mean vectors = 1.4918

df = 18 and 78 P less than .1159

Variable	Between Mean Square	Univariate F	P less than
Auditory-Vocal Automatic	245.0387	1.5900	.2148
Visual Decoding	2.8687	.0120	.9881
Motor Encoding	141.5187	.5395	.5867
Auditory-Vocal Association	205.0937	2.4090	.1010
Visual-Motor Sequencing	50.0333	.6066	.5495
Vocal Encoding	392.6569	2.0639	.1384
Auditory-Vocal Sequencing	295.5856	1.6714	.1990
Visual-Motor Association	643.2411	2.8556	.0676
Auditory Decoding	1338.7306	7.1230	.0020

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

Table 9

Auditory-Vocal Automatic Test
Mean Language Age Difference Score in Months
Three Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	- 8.4	- .8	-9.2	-37.68
Ameliorative	24	-12.1	5.5	-6.6	-36.51
Direct Verbal	10	-12.6	12.9	.3	-29.01

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the multivariate F was nonsignificant.

Table 10

Visual Decoding Test
Mean Language Age Difference Score in Months
Three Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	-1.3	1.2	- .1	-24.02
Ameliorative	24	- .6	2.9	2.3	-23.90
Direct Verbal	10	3.5	-1.6	1.9	-23.08

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the multivariate F was nonsignificant.

Table 11

Motor Encoding Test
Mean Language Age Difference Score in Months
Three Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	-1.6	1.3	- .3	2.03
Ameliorative	24	-8.2	1.2	-7.0	.64
Direct Verbal	10	-6.8	8.4	1.6	7.36

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the multivariate F was nonsignificant.

Table 12

Auditory-Vocal Association Test
Mean Language Age Difference Score in Months
Three Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	-6.1	4.5	-1.6	28.92
Ameliorative	24	-5.9	8.5	2.6	31.04
Direct Verbal	10	-6.9	13.4	6.5	37.17

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the multivariate F was nonsignificant.

Table 13

Visual-Motor Sequencing Test
Mean Language Age Difference Score in Months
Three Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	-10.8	3.3	-7.5	30.66
Ameliorative	24	- 7.7	1.2	-6.5	31.11
Direct Verbal	10	- 5.4	2.0	-3.4	35.20

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the multivariate F was nonsignificant.

Table 14

Vocal Encoding Test
Mean Language Age Difference Score in Months
Three Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	-15.1	6.8	- 8.3	33.92
Ameliorative	24	-14.7	4.0	-10.7	29.76
Direct Verbal	10	-13.8	14.1	.3	41.24

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the multivariate F was nonsignificant.

Table 15

Auditory-Vocal Sequencing Test
Mean Language Age Difference Score in Months
Three Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	2.5	-5.4	-2.9	12.29
Ameliorative	24	1.6	- .3	1.3	20.53
Direct Verbal	10	2.3	1.2	3.5	20.18

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the multivariate F was nonsignificant.

Table 16

Visual-Motor Association Test
Mean Language Age Difference Score in Months
Three Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	- 2.6	-2.2	-4.8	48.09
Ameliorative	24	10.9	-1.7	9.2	61.38
Direct Verbal	10	- .7	3.7	3.0	49.93

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the multivariate F was nonsignificant.

Table 17

Auditory Decoding Test
Mean Language Age Difference Score in Months
Three Groups for Two Years

Group	N	Test 1	diff.	Test 3	Covaried Mean
Traditional	25	-4.5	.9	- 3.6	9.58
Ameliorative	24	2.0	- 2.0	.0	16.86
Direct Verbal	10	1.2	14.3	15.5	30.97

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the multivariate F was nonsignificant.

Appendix E

Stanford-Binet Mean IQ by Race and Sex
Three Groups for Three Years

Group	Race	Sex	N	Test 1	Test 1-2 diff.	Test 2	Test 1-3 diff.	Test 3	Test 1-4 diff.	Test 4
Traditional	Caucasian	Male	5	94.4	8.8	103.2	6.2	100.6	9.2	103.6
	Negro	Male	10	90.7	10.3	101.0	7.7	98.4	2.9	93.6
	Caucasian	Female	4	103.8	12.4	116.2	3.4	107.2	10.0	113.8
	Negro	Female	6	94.3	1.4	95.7	2.9	97.2	4.4	98.7
Ameliorative	Caucasian	Male	4	97.2	14.0	111.2	17.8	115.0	13.8	111.0
	Negro	Male	7	91.1	13.9	105.0	11.3	102.4	8.5	99.6
	Caucasian	Female	3	109.0	12.3	121.3	15.0	124.0	7.0	116.0
	Negro	Female	10	95.5	14.2	109.7	10.2	105.7	6.0	101.5
Direct Verbal	Caucasian	Male	1	84	16	100	24	108	10	94
	Negro	Male	3	96.0	15.0	111.0	31.0	127.0	21.7	117.7
	Caucasian	Female	2	109.0	14.0	123.0	20.0	129.0	16.5	125.5
	Negro	Female	4	94.0	12.0	106.0	20.8	114.8	5.8	99.8

NOTE: A discussion of differential effects of programs based on data in this table is inappropriate because of the small numbers of children in these categories.

Appendix F

Traditional, Ameliorative, and Direct Verbal Groups
ITPA Subtests. Batteries 1 and 4

Tables 1 - 9

Table 1

Vocal Encoding Test
Mean Language Age Difference Score in Months
Three Groups for Three Years

Group	N	Test 1	diff.	Test 4	Covaried Mean
Traditional	25	-15.1	3.7	-11.4	-20.68
Ameliorative	24	-14.7	7.5	- 7.2	-19.23
Direct Verbal	10	-13.8	7.5	- 6.3	-20.10

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the multivariate F was nonsignificant.

Table 2

Auditory-Vocal Automatic Test
Mean Language Age Difference Score in Months
Three Groups for Three Years

Group	N	Test 1	diff.	Test 4	Covaried Mean
Traditional	25	- 8.4	- 2.2	-10.6	-54.14
Ameliorative	24	-12.1	3.0	- 9.1	-52.17
Direct Verbal	10	-12.6	11.5	- 1.1	-43.19

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the multivariate F was nonsignificant.

Table 3

Auditory-Vocal Association Test
Mean Language Age Difference Score in Months
Three Groups for Three Years

Group	N	Test 1	diff.	Test 4	Covaried Mean
Traditional	25	-6.1	2.9	-3.2	16.30
Ameliorative	24	-5.9	2.3	-3.6	14.81
Direct Verbal	10	-6.9	6.3	- .6	18.34

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the multivariate F was nonsignificant.

Table 4

Motor Encoding Test
Mean Language Age Difference Score in Months
Three Groups for Three Years

Group	N	Test 1	diff.	Test 4	Covaried Mean
Traditional	25	-1.6	-3.0	- 4.6	- 9.94
Ameliorative	24	-8.2	-3.6	-11.8	-10.98
Direct Verbal	10	-6.8	6.9	.1	- 2.39

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the multivariate F was nonsignificant.

Table 5

Visual-Motor Sequencing Test
Mean Language Age Difference Score in Months
Three Groups for Three Years

Group	N	Test 1	diff.	Test 4	Covaried Mean
Traditional	25	-10.8	-.1	-10.9	25.38
Ameliorative	24	- 7.7	-.3	- 8.0	25.06
Direct Verbal	10	- 5.4	-.4	- 5.8	31.48

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the multivariate F was nonsignificant.

Table 6

Auditory Decoding Test
Mean Language Age Difference Score in Months
Three Groups for Three Years

Group	N	Test 1	diff.	Test 4	Covaried Mean
Traditional	25	-4.5	- .6	-5.1	53.85
Ameliorative	24	2.0	-4.9	-2.9	53.60
Direct Verbal	10	1.2	.9	2.1	58.98

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the multivariate F was nonsignificant.

Table 7

Auditory-Vocal Sequencing Test
Mean Language Age Difference Score in Months
Three Groups for Three Years

Group	N	Test 1	diff.	Test 4	Covaried Mean
Traditional	25	2.5	-9.0	-6.5	27.09
Ameliorative	24	1.6	-4.0	-2.4	27.32
Direct Verbal	10	2.3	2.5	4.8	34.68

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the multivariate F was nonsignificant.

Table 8

Visual Motor Association Test
Mean Language Age Difference Score in Months
Three Groups for Three Years

Group	N	Test 1	diff.	Test 4	Covaried Mean
Traditional	25	- 2.6	2.4	- .2	-24.43
Ameliorative	24	10.9	-4.6	6.3	-20.87
Direct Verbal	10	- .7	3.1	2.4	-25.54

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the multivariate F was nonsignificant.

Table 9

Visual Decoding Test
Mean Language Age Difference Score in Months
Three Groups for Three Years

Group	N	Test 1	diff.	Test 4	Covaried Mean
Traditional	25	-1.3	3.9	2.6	47.29
Ameliorative	24	- .6	-8.2	-8.8	32.93
Direct Verbal	10	3.5	.4	3.9	47.45

NOTE: Initial language age difference scores (in months) from the nine ITPA subtests were used as covariates.

A Newman-Keuls test was not conducted because the multivariate F was nonsignificant.

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